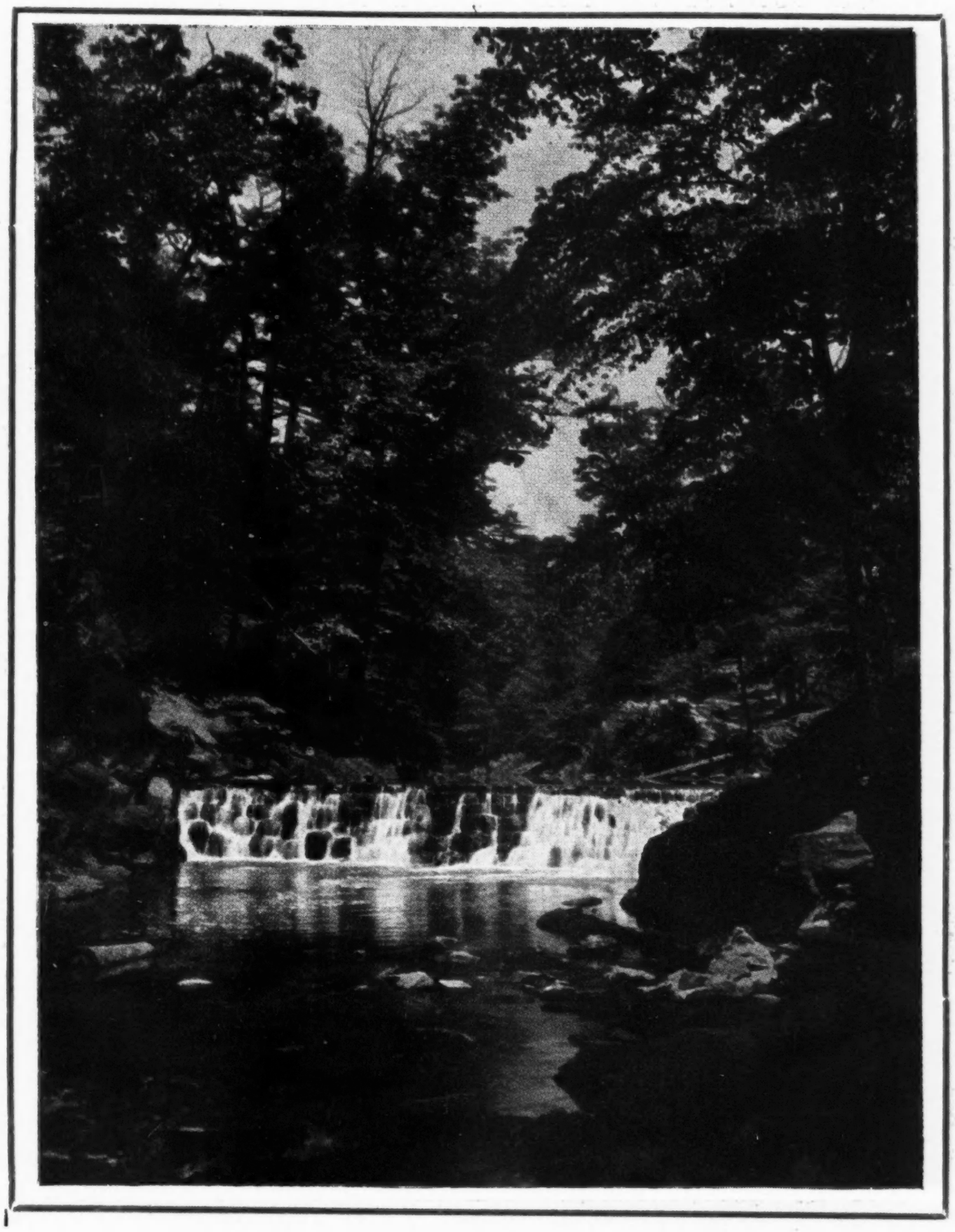
The Garden Journal

of the New York Botanical Garden



Vol. I, No. 4 July-Aug., 195

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Water-lily pools, perennial borders and displays of annuals will please the eyes of visitors to The New York Botanical Garden during July and August. Actually, whatever the season, the keen plantsman, amateur or professional, will always find something of interest at The New York Botanical Garden.

DOROTHY EBEL HANSELL
Editor

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THE GARDEN JOURNAL
of The New York Botanical Garden

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AMONG OUR CONTRIBUTORS

REV. LEE M. FAIRCHILD leads a very busy life fulfilling his ministerial duties with the Presbyterian Church at Mt. Kisco, N. Y., and pursuing his hobby of breeding and growing gladiolus; he is official tester of gladiolus for the Men's Garden Club of America, writer for church and gardening magazines... SIDNEY E. KNIGHT is editor of the JOURNAL OF ORGANIC SOIL ASSN. OF SOUTH AFRICA, and an ardent amateur gardener in that distant land . . . DR. VICTOR A. TIEDJENS is Director of the Truck Farm Experimental Station at Norfolk, Va. . . . DR. DAVID D. KECK became Head Curator of The New York Botanical Garden the first of this year; he had been identified with the Carnegie Institution of Washington since 1926, first at Berkeley, California, then (1929) as a member of the Institution's staff at Stanford. . . H. SOULANGE-BODIN is Secretary of *Des Amateurs De Jardin*; one of his forebears, Chevalier Soulange-Bodin, brought out an unknown magnolia species from the Himalayas and presented it to the Empress Josephine. In her enthusiasm she declared, "Henceforth it will bear your name." This magnolia, *M. Soulangeana*, was painted by Redoute, and the painting is in the possession of M. Soulange-Bodin . . . We are grateful to GEORGE W. GRAY for permission to reprint from his report to the Rockefeller Foundation, as it presents a very clear picture of the valuable work which Dr. Igor N. Asheshov is conducting in the scientific laboratory of The New York Botanical Garden . . . DR. JESSIE G. FISKE, chairman of the Departament of Botany and Zoology at New Jersey College for Women, has been fascinated by seeds ever since the days when she was growing up in the fields around her home in Brookfield, Vt.; she served New Jersey as State Seed Analyst for thirty years — the first woman to hold this position—and supervised the seed control laboratories, did extension work, and lectured; is expert on weeds as well as commercial crops . . . GEORGE L. SLATE, Associate Professor of Pomology at New York State Experimental Station, Geneva, and breeder of small fruits, engages in lily breeding for pleasure, is editor of the LILY YEAR BOOK OF THE NORTH AMERICAN LILY SOCIETY . . . DR. HERBERT L. EVERETT is Research Assistant in the Department of Genetics at the Connecticut Agricultural Experiment Station, New Haven . . . DR. A. B. STOUT is Curator Emeritus of The New York Botanical Garden . . . FRANK C. MacKEEVER is Custodian of the herbarium at The New York Botanical Garden . . . GERTRUDE B. FOSTER is editor of THE HERB GROWER MAGAZINE.

CREDIT FOR ILLUSTRATIONS

Front cover, kodachrome of the waterfall in the Bronx River flowing through The New York Botanical Garden, by David Seabrooks; page 98, Rev. Lee M. Fairchild; page 99, Adrian Boutrelle; pages 100, 101, furnished by author; pages 103, 104, Prof. Dr. H. J. Venema, Director of the Arboretum at Wageningen; page 105, Boudot-Lamotte; page 107, Dr. Igor N. Asheshov; page 108, Gottscho-Schleisner; page 109, E. N. Mitchell; pages 111, 112, 113, Jan de Graaf, Oregon Bulb Farms; pages 114, 115, photos furnished by author; page 117, Patric P. Jacovidis for Farr Nursery Co.; page 119, E. N. Mitchell; pages 120, 121, Gottscho-Schleisner; pages 123, 124, 125, 126, E. N. Mitchell; back cover, hardy water-lily pool at The New York Botanical Garden, Gottscho-Schleisner.

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In four ways do the blessings of the garden (and in many another way, no doubt) descend upon those who love it. And all four blessings follow on active participation in its work. For it is a truth, too vital ever to be forgotten, that the joy of the garden is to the gardener just as a song is to the singer.

The first blessing is the benediction of a tired body.
The second blessing of gardening comes from having a share in creating beauty.
The third blessing of the garden is the blessing of adventure.
And the garden's fourth blessing — the blessing of tranquility.

The body tired with its labors, the soul steeped in beauty, the trek of adventure having led from the commonplace world to a new one, then the gardener enjoys a peace that is both completely gratifying and past being understood.

John T. Scheepers, in "Beauty from Bulbs".

NEW FLOWERS

Amateur Style

By Lee M. Fairchild

THIS is simply an account of the experiences of an amateur gardener in the creation of new varieties of flowers; in this particular case, gladiolus. No technical discussion of chromosomes, enzymes, recessive and dominant characters, or of the Mendelian Law will be involved. What has been done has been done for fun. Whatever may have been achieved has been the result, not of scientific endeavor, but of inspiration, perspiration, and the happy turning of Fortune's wheel.

Having been born with an innate love for nature in general and for the soil and growing things in particular, I have always felt the need for some expression of that love through the growing of living plants. Because it is the lot of one in the ministerial profession never to have a permanent home or garden of his own, I decided, after small starts in making a general garden, that it would be best in my particular case to specialize in a plant or flower that would lend itself readily to specialization and would have the further characteristic of movability, so the work could be picked up and transplanted if necessary. Gladiolus seemed to fulfill the requirements. Thus, I progressed from a small beginning with a few corms of named varieties to the growing of many hundreds of varieties of gladiolus and then advanced by various channels to hybridizing and creating new kinds.

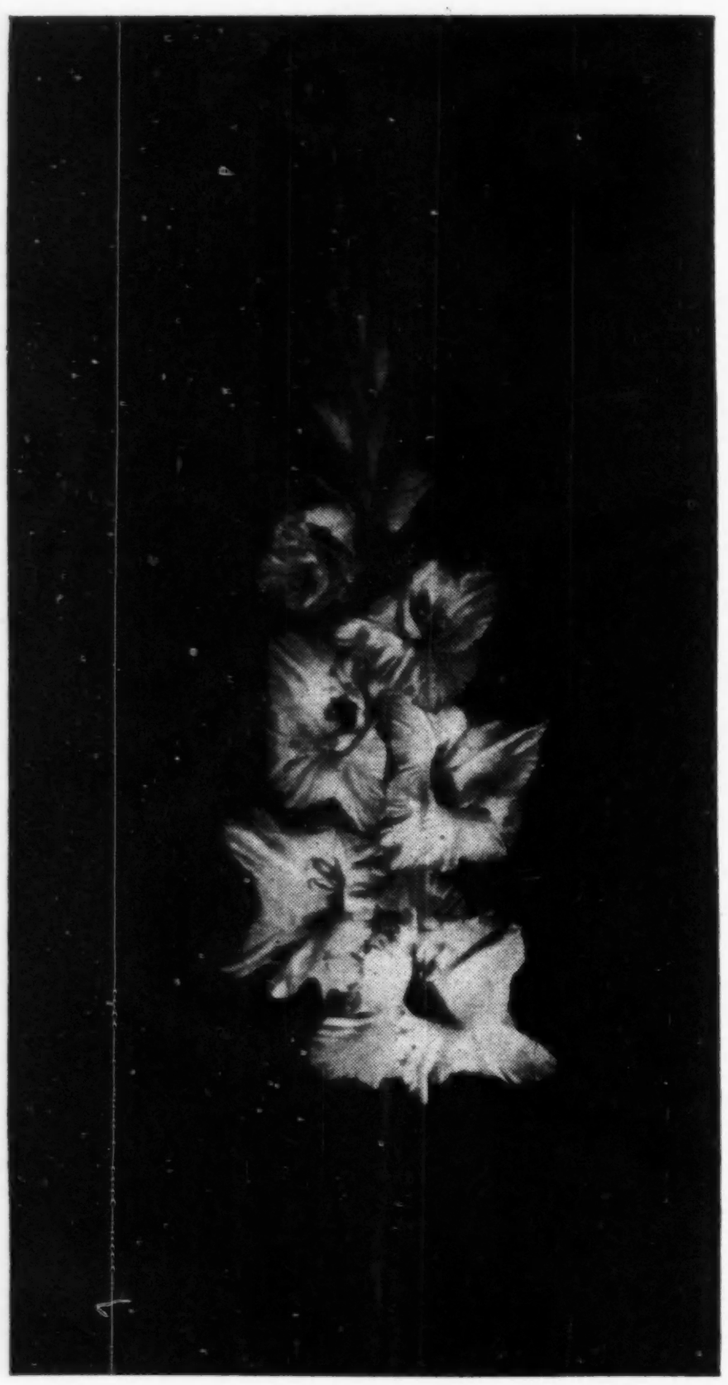
At the risk of sounding trite, let me say that hybridizing is probably the most exciting part of the hobby of gladiolus growing. No doubt it is the most exciting part in the growing of any of the hobby flowers. The mechanics are simple. Yet one should not get the impression that "there is nothing to it". It requires a whale of a lot of patience, many hours of work, and a "feel" for it that many folks will not easily acquire.

New varieties of gladiolus are obtained from seed, which is usually secured from hand-pollenized flowers. Cross-pollenization is affected by placing the pollen from the anther of the male variety on the stigma of the female variety. This is done after the anthers have been removed from the female variety so no "selfing" will take place. The anthers are removed from the plant chosen to bear the seed just as soon as the florets begin to open. Usually the stigma will not receive pollen readily until after the florets have been open for at least a day. It is not possible, therefore, to pollenize more than one or two florets on a single spike in a given day. The pollen is ready for use after the anthers have opened and the powdery substance (pollen) is seen on them. In the field, this pollen does not remain in good condition for very long; so I bring the whole spike of blooms into the house where it is dry, and then carry it to the field when hybridizing is to be done.

For placing the pollen, some gardeners use a small brush or a toothpick. Personally, I like to take the anther that is bearing the pollen and then brush it directly onto the stigma of the seed-bearing plant. If the pollen is in good condition, there will be enough on one of the three anthers found in each floret to fertilize each stigma. The pollen can be made to go a long way, when one cuts and keeps the whole spike. In fact, as the spike will last nearly a week, one will have a good supply on hand for many crosses from only one plant.

To prevent chance pollenization, the petals of the fertilized floret may be woven together with a toothpick, or the stigma may be fastened to the upper petal by placing the toothpick through that petal. In either case, it will be seen that a pocketful of toothpicks is a very handy aid.

Seed pods are gathered after they have begun to turn brown and are just beginning to burst. They are then dried thoroughly; finally, the seeds are cleaned from them and placed in an



envelope for storage in a dry place for the winter.

I use a well-prepared seed bed with frame for sowing the seeds. The seeds are covered with about one quarter-inch of soil, which is firmly pressed down. If the bed is kept slightly moist all the time, the seeds germinate readily. I find that a light covering of peat moss is a help in keeping the bed moist. A shade of lathe or tobacco cloth, to give about the same shading effect as a lathe house, is also needed if the little plants are to be kept growing steadily. If the bed becomes too hot or dry, the little seedling plants harden off before they have made a corm of any appreciable size.

These young corms are handled the same as any gladiolus corms over the winter — that is, they are allowed to dry fairly quickly, then are stored in a cool dry place until planting time next spring. In the spring they are planted in the open garden in full sun to grow into full-size gladiolus corms. Since they will probably be quite small the first year, they are planted only two inches deep.

Some flowers will form during the first year from the small seedling corms. The flowers, however, will

Left, Janet Lee and, below, Kathy Lee, two new gladiolus introduced by the author.

not be characteristic until they come from full-size corms in the second year of growing.

The thing to remember here, and the thing that makes the venture so exciting, is that no matter how many seedling corms are planted, no matter even if they are from the same seed pot and have the same parents, no two will be exactly alike. I plant, on the average, fifteen thousand hand-pollenized seeds each year, of which probably half reach the full-growth stage and show characteristic bloom. That means about seventy-five hundred new flowers each year. These, of course, are added to the selections from other years so the hybridizing garden in time reaches into many, many thousands.

But that doesn't mean that many new varieties! The great majority of these seedling corms do not produce superior gladiolus. There will be many that are as good as named varieties, but not better; in which case there is no good purpose served in naming them and introducing them to the world. Pfitzer used to estimate something like one new variety for each eight thousand seeds started. I believe that a better average is possible today, largely because we have the work of older hybridizers to build on. Pfitzer, for instance, seems to have done a lot of line breeding — which means that a Pfitzer red will be most likely to transmit its red color with a good deal of positiveness. The same goes for his yellows, whites and violets. This is meant to be only one example of the advantage of building on the work of other breeders.

So far I have been speaking mostly of the "mechanics" of hybridizing. The rest belongs to the "art" of the hybridist; we call it "art", because it consists of an interplay of judgment and intuition.

In making the selections from the seedling plants as they bloom, the hybridist must be able to distinguish the truly beautiful and new from the ordinary. And he must not be too fond of his own gladiolus children, simply because they are his own. He must try to look at them with an unprejudiced eye, and it is better in the long run to be overly critical than to be overly indulgent. This is not an easy attitude to keep, especially if there are friends around who are exceedingly appreciative and likely to be too complimentary in their remarks.

Judgment must also be based on knowledge — knowledge of what the existing many hundreds of varieties are like. Is this new pink really an improvement? One can say so, only if he can make a comparison in his mind with the other pinks that are in existence. Even if it is an improvement, or appears to be at first glance, a number of years of propagation and trial must pass before the final tale is told. A sort of "rule of thumb" that I use is this: "Unless the new flower stops you dead in your tracks the first time you see it; unless it practically takes your breath away; unless you know almost instinctively that 'this is it', better throw it away."

Now for the testing. Not only must the new variety have beauty and distinctiveness, it must also meet other requirements. It must be a strong healthy grower, showing fair resistance to rots and the diseases that af-

fect plant life. It must be a good propagator, in other words; for if the new variety is really good, there will ultimately be a big demand for corms. The original corm must be able to produce a large number of cormels which, in turn, must germinate readily. Finally, from a mechanical point of view, a cut spike of the variety should have the ability to open in water, even if cut when only the lower floret is showing color. This is the way they are handled for the florist's trade, and this is the acid test.

The breeding of flowers, at least as it applies to the gladiolus, is not an exact science. We do not begin with species, but with hybrids. And hybrids crossed on hybrids never, for practical purposes at least, can be made to reproduce their like from seed. After the first corm is obtained, all future progeny must come from it. It is not an exact science, because we can never tell what a given cross will produce, and a given cross will never produce two likes no matter how many times it is made, and no matter how many hundreds of seeds are obtained from it.

After a time, the hybridizer will learn from experience that certain varieties used as parents are likely to tend certain ways, to show certain dominant characteristics. One variety will tend to give large flowers to its offspring, another to dwarf them; another will tend to give ruffling, another to clean up muddy coloring. But he never knows exactly, he can only approximate. So hybridizing becomes, for the amateur at least, a combination of work, knowledge, intuition and last but not least, enthusiasm.

To date, I have had the good fortune to produce six new varieties worthy of being named and introduced to the world. Janet Lee, not as tall and perfect in growth as I should like, but a color break, a soft blending of apricot and cream with heavily ruffled and crinkled floret, won its place in the "Hall of Fame" in the New England Gladiolus Show at Boston in 1947. This means that by popular vote of the visiting public it was elected over all other varieties so entered as the most beautiful. It was also awarded the American Home Achievement Medal for that year. Kathy Lee is a heavily ruffled, light yellow gladiolus that gives promise of filling a need as a commercial cut-flower yellow. Last year, a medium-sized gladiolus with heavily ruffled, velvety, deep cerise florets was introduced as Lila Wallace. It was voted the outstanding 300 class new variety of 1949 at a meeting of the New England Gladiolus Society.

This year two small-flowered kinds have been introduced to the gladiolus growing world: Flair, an orchid flowered type, being ivory in color with a prominent throat of deep orchid, is the proud possessor of an American Home Achievement Award. Spunky is a little fellow which is deep brown in color with an edging of silver. The coloring is unusual for the smaller flowered kinds. Another that was named, largely because of its promise in the cut-flower field, is Teenager, a light rose-colored variety that appears to be prolific, healthy and very consistent in growth.

Others that have been tested, named, and will make their bow in the next year or so as stock becomes more generally available are: Hilltopper, a clean soft red that makes a good percentage of exhibition type spikes; High Style, an exhibition salmon-pink with a blue marking in the throat; Brigadoon, a tall purplish rose that carries the unusual total of twenty-six buds; and Cascade, a large ruffled cream that has already won division championships.

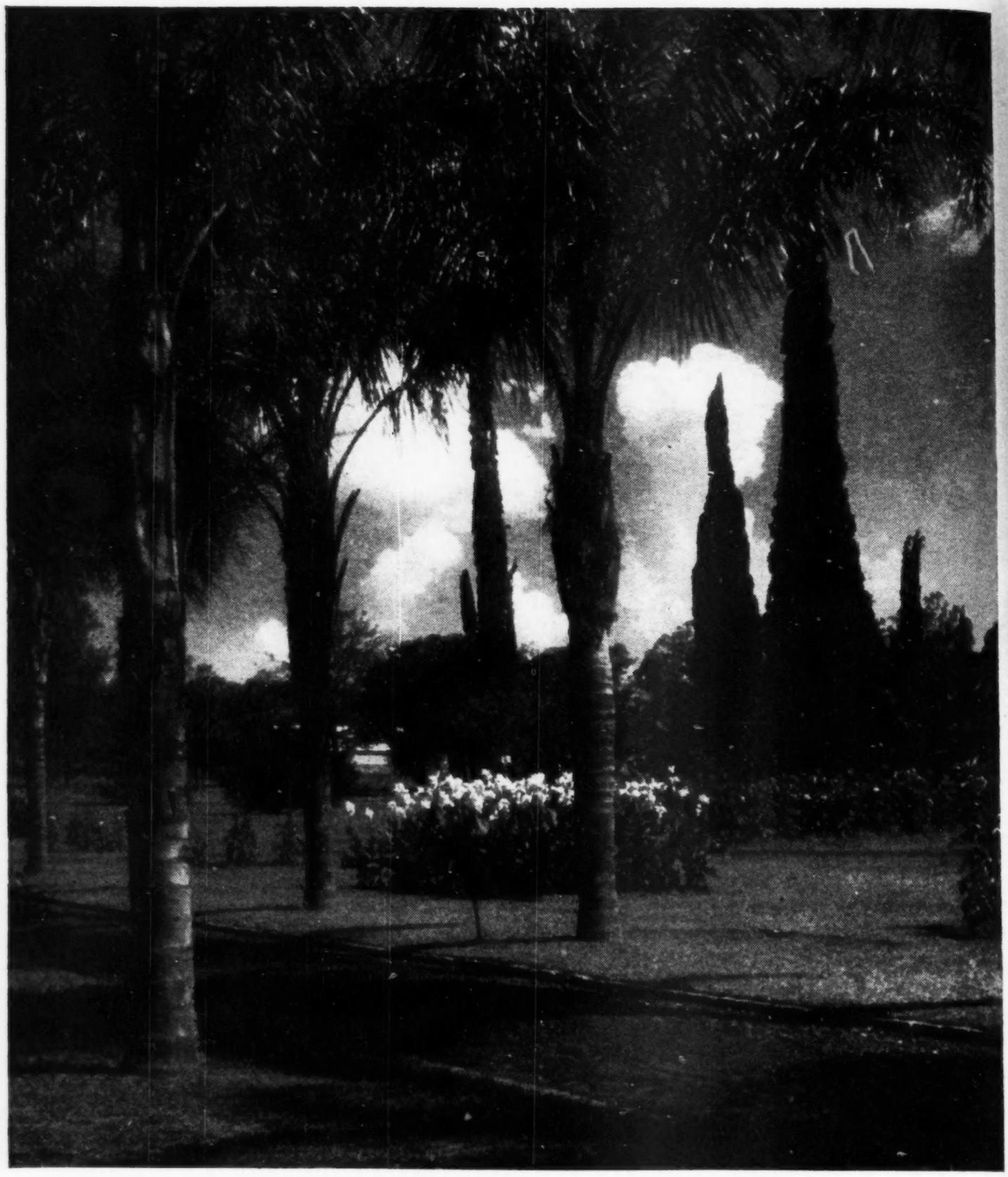
After eight or nine years' work, this does not seem like many new varieties. It isn't. But we must remember that nothing will happen for the first few years beyond making the first crosses and the first selections. Then come the years of trial and propagation. Only now am I reaching the point where worthwhile new things are coming along in any quantity — and they are now coming in such a way as to promise much for the years immediately ahead. With good luck, and in this venture luck must play its part, there should be more good varieties to introduce.

Whether I succeed in producing too many new varieties is probably of secondary importance, anyway. What is most important is the venture itself — and what it means in the way of discovery, thrills, and downright satisfaction.

Gladiolus may be artistically arranged as was done by Mrs. A. Laufter at an exhibit of the Long Island Horticultural Society.

GARDENS of THE GOLDEN RAND

By Sidney E. Knight



The Mayor's Garden, Alexandra Park, Maritzburg, Natal. The palms are *Cocos plumosa* and the towering, spire-shaped evergreens are *Cupressus pyramidalis*. This park is famous for its twelve acres of rock garden.

BEFORE I could plan or plant a garden in the Transvaal a few miles from Johannesburg, I had to drill, blast and shovel away many tons of rock, an outcrop of the main reef that has supplied the world with most of its gold during the past sixty years. Not that I was interested overmuch in the gold-bearing content of the banket — at one half ounce to the ton it was not recoverable; but as the crushed rock has since gone into my paths and drive, I can confidently say that I am walking on gold. However, the gold in my chrysanthemums, carnations and marigolds is of more interest to me than the traces of the precious metal under my feet.

Gardens the world over are governed by soil and climate. Johannesburg, with Mexico City's winter climate, Denver's altitude and Ohio's tropical summer downpours can, and does provide the gardener with more problems than the country's racial problems — and they are complex enough! Problem No. 1 is the soil. Of volcanic origin, in its virgin state most of it is a red, dusty loam, generally less than a foot deep, deficient in humus and mineral elements, but responding quickly to the addition of fertilizers, manure and compost. This latter is also invaluable as a mulch, conserving moisture and curbing water run-off.

Most of the Rand's pioneers were Cornish miners and engineers, whose wives brought their love of English flowers with them. Although appreciating the beauty of the flamboyants and the wide range of the indigenous group such as gladioli, watsonias, Barberton and Namaqualand daisies, their tastes ran naturally to roses, snapdragons, zinnias, delphiniums, larkspurs, sweet peas and the rest of the annuals, all of which stand up well to the fierce sunlight and slashing thunder-storms. But their natural setting, the velvety green lawns of England, are absent. The planting and after-care of lawns in Johannesburg have given the gardener more headaches than all his other horticultural efforts.

Many varieties of grasses have been tried: Florida (*Cynodon Transvaalensis*) Kikuyu (the East African grass also useful for stock grazing), Bradley, Magennis, a natural hybrid of Blue Couch (*Cynodon dactylon*), and others, but all the painstaking efforts generally end in digging up the lawn every two or three years and planting or sowing afresh. Fungus diseases; the vicious attacks of ants, white, red and black; the long summer droughts that occur even in the so-called rainy season; the hot dry winds in summer and the heavy ground frosts in winter, all play havoc with the suburban lawn.

Kikuyu (*Pennisetum clandestinum*) is a hardy useful grass that can under moist conditions choke itself with its own luxuriance. Most of the Transvaal parks, school grounds, playing fields and race tracks have been converted from red, dusty sterile areas to pleasant green expanses in summer

Water-lillies in Happy Valley Public Garden, Port Elizabeth, include the tropical varieties Mrs. George H. Pring and Stella Gurney, as well as hardy types. Among the trees around the pond are the South African palm, *Phoenix reclinata*, swamp cypress, weeping willow and banana.

through the medium of Kikuyu. During the long dry spell in winter, the grass turns yellow but comes to life with the summer rains and soon assumes a fresh green color.

Fortunately, flowers and trees are easier to grow than in some neighboring African territories with their semi-desert conditions. In early spring (September), especially if the rains are early, the gardens of the Golden Rand emerge from their dusty, winter condition. The best results are obtained by sowing and planting in late autumn (about March or April). Sweet peas in particular, always a refreshing sight in spring to eyes grown tired with gazing at dessicated flora and yellow grass, have made plenty of root growth during the dry months, only needing watering once a week and protection from the cold south wind; but trenching with manure, compost or leafmold about a foot down is essential if size of bloom, long stalk and flowering period are to be maintained. Mulching with straw, grass or reeds is also advisable.

Roses, the housewife's favorite among the cut flowers, showing up their real beauty in a dim room rather than in strong sunlight, can be reckoned the gardener's best friend. They require careful nursing, however, when planted in their permanent bed as this period coincides with hot sun and piercing winds. Constant syringing is necessary to keep the many pests at bay; and with a little topdressing and feeding with liquid manure, blooming is prolonged during the seven months of summer. The new American varieties, such as Mirandy, Peace, with its pink-tinted yellow buds which seem to deepen as the flower opens, and Red Ensign, All-American winners for 1945-6-7 respectively, and Forty-Niner, Tallyho, Applause and Rose of Freedom are to be seen everywhere. Taking kindly to South African trying conditions, they are proving very popular.

Carnations do well; the light sandy soil, with the addition of leafmold and a little bonemeal, suits them. They are also generally pest-free, a great blessing in a land with all the horticultural plagues of Egypt from green fly to migratory locusts.

A rock garden is a feature of many gardens, the boulders and rocks for the building are available outside most garden gates on the veld. Succulents of all kinds grow easily and, what is of the highest importance, need little water. Generally topped with one of the native aloes (over four hundred known varieties) there is unlimited range down through the "stone-plants", the dove-grey *Lithops Fulleri,* the ground-colored *Lithops pseudotruncatella* and the pale *Lithops Meyeri,* to the mesembryanthemums, purple, cream, yellow and white, button-type *Conophytum placitum,* with prettily marked leaves, and the fascinating "kaffir-hut-plant", *Euphorbia obesa,* so-called because of its likeness to a native African hut. It is protected by law to prevent its extermination and its export is totally prohibited.

No garden in Africa is complete without a few flowering trees and shrubs. Natives of Australia have been introduced to add to the many indigenous species and the finest sight I have seen in gardens from Plymouth to Vladivostok was a flowering Australian red gum with purple morning-glories climbing on all sides to the top of its twenty-foot height.

Shade is all-important in a land

The home, in early Dutch colonial style, and the lovely garden of H. M. Swan at Johannesburg, South Africa.

where the average annual sunshine exceeds that of California. The artificial lakes along the Reef are ringed around with the common weeping willow, Australian blue gum and Scotch pine. In private gardens, all kinds of trees can be seen from the squat acacia to the tall graceful poplar. A feature of the country around Johannesburg in spring is the golden mimosa, while in the gardens jacaranda, apricot, peach, Japanese plum, nectarine, apple, pear and ornamental cherry are common. Spring time is "jacaranda time" in Johannesburg and its neighboring city, Pretoria. To ride on the top of a trolley-bus through the suburbs at tree-top level is to experience the delightful sensation of gliding through a misty cloud of floating bluebells.

One great hazard threatens all forms of Transvaal horticulture in the summer months — a vicious, flaying hailstorm which can undo the year's work in a few minutes. One Transvaal apple grower has gone to considerable expense in erecting fine wire netting over his trees in an endeavor to ward off a catastrophe that breaks the gardener's heart, as he watches his garden being cut to ribbons. It is on record that in Maritzburg, Natal, in April, 1874, hailstones fell weighing one and a half pounds each, going through corrugated iron roofs "like paper."

Such is the gardener's life in Johannesburg, the city of beautiful gardens — one long struggle against drought, floods, hail, pests and harsh winds to achieve beauty, a beauty unknown before the advent of the white man. The beauty of a bed of Iceland poppies dancing in the breeze on a fresh spring morning after an overnight thunderstorm; sweet peas rioting up and over an ugly fence; pink and scarlet geraniums trailing down in a cascade of vivid color from a window box.

Over the Transvaal highveld little more than fifty years ago, the leopard and the lion roamed, the raiding Zulus and Matabele spread death, rapine and destruction among the other peaceful, pastoral Bantu tribes. Today, first-generation descendants of those warrior blacks tend and water beds of roses in suburban homes, the original cuttings of which were brought from the New World by the swift Pan-American Clipper.

"YANKEE LAWN" in the SOUTH

By Victor A. Tiedjens

An ex-Yankee living in the South, I've found a lawn to be one of my biggest headaches. I thought the problem of getting a bluegrass lawn was merely a matter of lime and fertilizer, but my experience has proved it to be much more than that.

Actually, a good permanent lawn in the states bordering the Atlantic Coast south of the Mason and Dixon Line is an exception rather than the rule. There are several reasons for this, and among them may be mentioned soil acidity, hot weather, poor drainage, low fertility and weeds. The winters are open in this Tidewater area of Virginia and grasses will remain green all winter in eight out of ten years. So you can see it is important to have a lawn with perennial grasses.

My initial attempt at lawn making, after I had moved to Norfolk from up north, was a dismal failure. I found that unless perennial rye grass was sown in the fall, common chickweed (winter grass in the south) and its many relatives would take over during the winter and crabgrass would take over in the summer. Therefore, permanent lawn grasses were not included in the mixtures. Upon inquiry, I learned it was considered too hot in the summer for bluegrass. But, comparing temperatures with those in the bluegrass country, I found that our temperatures were not as high. I also found that bluegrass would do very well in the shade of deciduous trees; and in checking further, that bluegrass grew in limestone country.

My first procedure was to put pulverized magnesium limestone on the lawn without disturbing the soil, grass or weeds. Things began to happen! A small white clover came in profusely along with small islands of various species of grass. The first winter I was surprised when what I thought was a fine coverage of bluegrass turned out to be annual bluegrass. It seems to come in on limed soil, if the chickweed doesn't come in first. However, I noticed that the perennial bluegrass was getting established in spots — and that offered some encouragement.

That fall (1947) I broadcasted the second ton per acre of limestone, scratched the old lawn grass with a spike tooth harrow and sowed what was supposed to be a good mixture of grass seed. I had a beautiful growth on the soil, making as fine a turf as I could wish to see, but it wasn't grass or clover. It was blue field madder (*Sherardia arvensis*) — a wonderful groundcover which came in with the seed mixture.

Then Dr. Forman T. McLean and I got together on an experiment. We broke up the sod with a rototiller and planted ten by twenty-foot plots in duplicate to several grasses, as shown in the accompanying table on page 128.

These results are very interesting. I am convinced that a mixture of the seed used on Plots Nos. 4, 6 and 7, if sown in September on a soil limed to a pH of 6.4 to 7.0, will make a good lawn.

Weeds are always a problem and will come in, if leaves or other debris are left on the turf to smother the grass. If it is possible to use the 2,4-D weed killers the lawn may be sprayed, thus giving the established grass a chance to spread and fill in. We have tried 2,4-D in comparison with other weed killers. Our experience so far is that the 2,4-D not only killed the weeds but apparently sterilized the soil so that seed did not germinate or, if it did, the young grass seedlings were killed on germination of the seed. Eventually, the tufts of established grass will fill in the bare areas but it seems desirable to sow some seed, two weeks after the 2,4-D treatment, to fill in the areas and not have the germinated seed killed by 2,4-D residue.

I am convinced that we can grow bluegrass in this part of the South. I talked to a group about our experiences a year ago, and one gardener told me he has had a perfect bluegrass lawn for seventeen years. All he does is spread 1,000 pounds of magnesium limestone per acre every winter.

There has been some reluctance to

(*Continued on page* 128)

Observations —

On Some European Botanic Gardens

By David D. Keck

Famous gardens extend far back in human history to ancient Egypt and Babylonia. At all periods much emphasis has been placed upon their cultural and recreational value as witness the long uninterrupted support of a number of botanic gardens that flourish today as they have for three hundred years or more.

A botanic garden may be said to differ from the ordinary garden or park particularly in its purposefulness. It combines the scientific or educational aspects with the recreational; in some cases, the latter may be entirely absent.

Probably the first collections that could be called botanic gardens in a present-day sense were the ancient "physic gardens" — assemblages of medicinal and drug plants often maintained by apothecaries themselves. Gradually the scope of botanic gardens expanded to include, in some cases, a national or continental collection of the flora, or representatives from the flora of the entire world geographically arranged. Then the gardens were arranged to show systems of classification. Early they became affiliated with botanical departments of universities as necessary for botanical instruction, or they stood as independent centers of scientific research with large libraries, herbaria, and laboratories incorporated within them. Kew Gardens, for instance, for over a century has maintained its position as the indispensable core of botanical science in the British Empire.

The earliest collections still in existence that were brought together as integral parts of the botanic departments of universities are the botanic garden of Padua, established in 1545, and the one in Pisa, of essentially the same age, both in Italy. By 1621 the first botanic garden in Great Britain had been established at Oxford, and in 1626 the *Jardin des Plantes* was founded in Paris. The oldest Scandinavian gardens are those in Copenhagen, Upsala and Lund.

While traveling in Europe in the summer of 1950 as a delegate to the Eighth International Botanical Congress in Stockholm, and as a visitor to botanical laboratories, experiment stations, and herbaria, I gave some attention to botanic gardens, but these visits were for the most part incidental to other occupations. Accordingly, the following is not the account of a professional botanist so much as some impressions gained by a casual observer who was enjoying what he saw.

We spent one day at the *Jardin des Plantes* in Paris. Part of that time was used in the herbarium, now well housed in a building erected with Rockefeller funds in the 1930's. Of the famous old botanic garden itself, our most vivid impression was of the extensive and well designed rockery at the height of its spring blooming, well

View of the arboretum of the State Agricultural University at Wageningen, looking toward the pergola. The arboretum was heavily damaged by tanks, horses and the military during World War II.

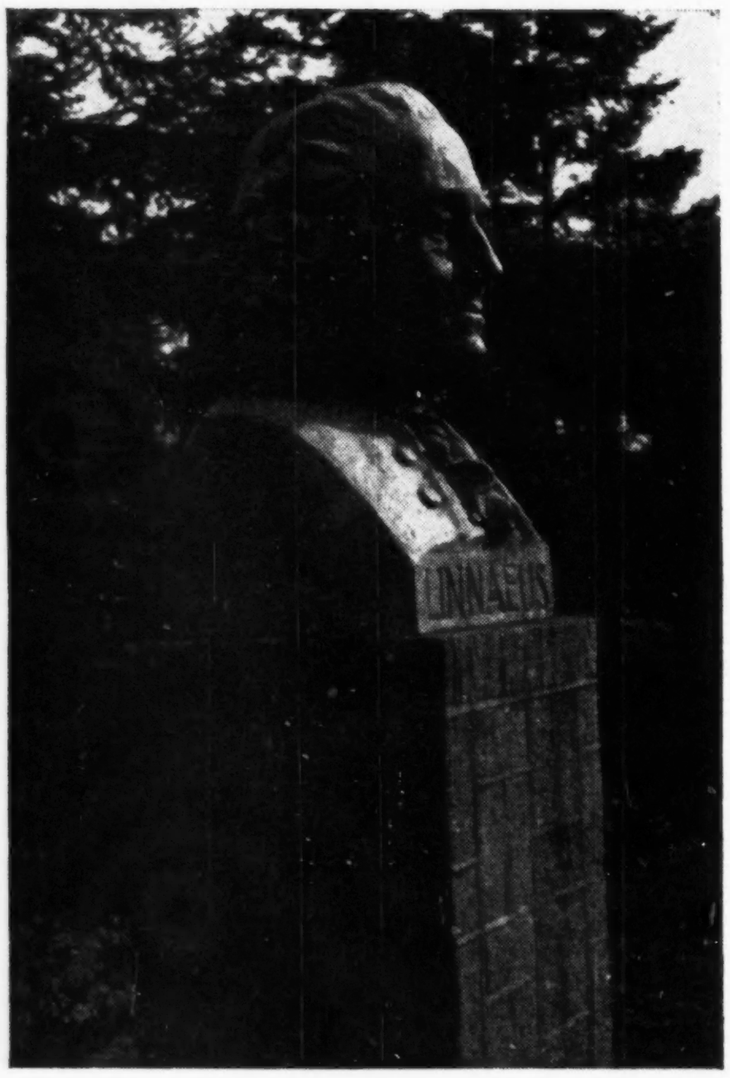
filled with treasures, and we were also pleased with the beautiful walks along avenues of peculiarly polled plane trees. The French delight in using the lopping shears, and their roadside trees in general are often retarded in growth, and in our eyes rather defaced, by over-pruning. These at the *Jardin,* however, were trained to form a rectangular archway over the roadways that was unusual and appealing. In one section of this garden, the plants are arranged systematically after the system of Jussieu.

In the Netherlands we were interested in the beautifully planned and arranged arboretum of the State Agricultural University in Wageningen, with many fine old trees remaining, although this ground had been overrun at two separate periods during World War II, on the second occasion being in No-Man's Land for days of hard fighting that nearly sacked the town. The new plantings that are going ahead there in these years of taxing reconstruction, to us signified the importance that is laid on the botanic garden in the cultural life of the community.

In this connection it should be pointed out that in Europe botanical gardens have always had an unusually high educational importance. Not only is it customary for each university or university town to have its own botanic garden, but many other cities and towns maintain public gardens in which the plants are labeled and so arranged as to serve as an outdoor museum. One result is that the European public knows its plants by their scientific names to a degree that is impressive to Americans.

The beautiful botanic garden of the University of Copenhagen, of some twenty-five acres, was not damaged by war, and it is one of the most beautiful to be seen. When laid out on its new site in 1871-74 it was on the outskirts of Copenhagen, but the city has so enveloped it that it now lies near the very center. Despite its unfavorable position from the point of view of growing plants, this garden contains an excellent variety of herbaceous and perennial species, including an outstanding collection of the plants native to Denmark that aims at completeness. These plants are arranged together on a slope in one section of the garden where different types of habitat are provided, and the whole assemblage makes a public exhibit of great educational value. The extensive rockery, laid out on a well executed artificial hill such as is found in a number of European botanical gardens, is another attractive feature of the Copenhagen garden.

Mention should be made of the excellent arboretum in Charlottenlund, just outside of Copenhagen, containing one of the outstanding collections of conifers in northern Europe. It was a rare treat to be introduced to these noble and exotic trees by the director, Dr. C. Syrach Larsen, who has lived



The new bust of Linnaeus, received from "Friends of the Arboretum," at the arboretum of the State Agricultural University at Wageningen, Holland.

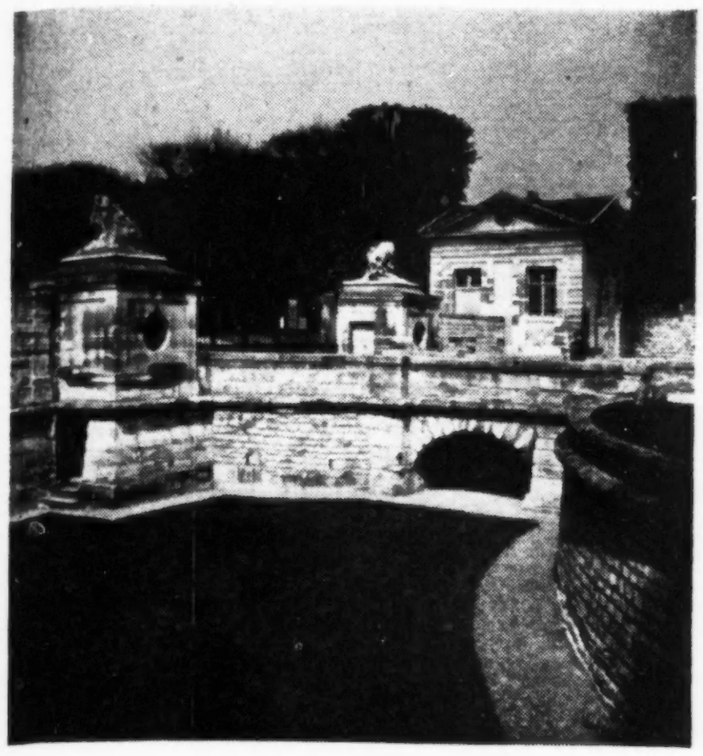
with them for over half a century and whose father was the founder of the garden. This collection is somewhat protected from the crowds, so that the trees can be approached by forest paths which give one a real feeling of intimacy with them. Many of these trees have served Dr. Larsen as stocks for his experiments in forest tree breeding that have set the pace for tree improvement in Scandinavia.

In extreme southern Sweden the university town of Lund carries its medieval heritage with quiet charm. Its dominant building is the tenth century cathedral, which stands beside the University, founded in 1658. The botanic garden of the University takes advantage of the uneven terrain across which it spreads, but it is not intensively developed. The plants are arranged systematically by families in circular beds, a system of greater advantage to the student interested in affinities than to the layman hoping for floral effects.

The botanic garden of Stockholm, called the *Bergiansk Botanisk Tradgarden* in honor of its founder, Peter Jonas Bergius, a student of Linnaeus, was established in 1791. It features an extensive systematic arrangement of plants and a rock garden built on three high mounds of granite that repsent the Alps and Scandinavia, Asia and America.

The city of Upsala is the seat of the oldest Swedish university, founded in 1477, which has ranked among the world's great institutions of learning since its reorganization in 1595. Of more interest to plant lovers, perhaps, is the fact that Upsala was the home of Carolus Linnaeus, and thus for an important period the capital of the botanical world. The present botanic garden of the university is a very worthy one dating back to 1787 and well maintained today. The plants within it are arranged in systematic, economic, and oceanographic sequences, and there are included an arboretum and a fruticetum.

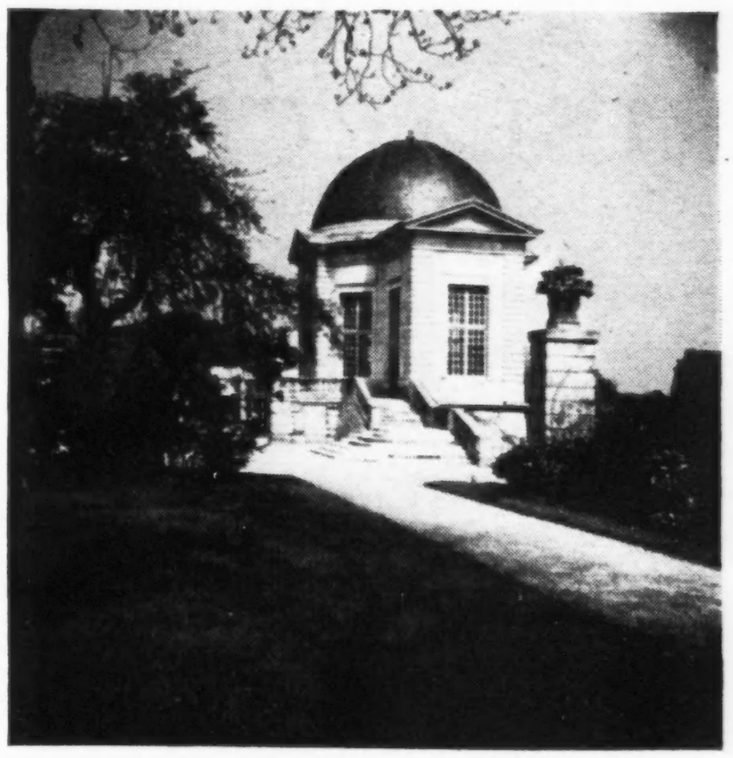
We gave more attention to the former botanic garden of the university, founded in 1655 by O. Rudbeck, Sr., and directed by Linnaeus himself from 1742-1775. This garden was restored in 1917 by a society founded for the purpose, to be maintained as it was in the time of Linnaeus. It is of great historic interest to botanical students to see the plants arranged in beds here as set out by Linnaeus to illustrate his sexual system of classification as published in his classic *Species Plantarum.* The plants are all labeled by their Linnaean names, many of which have since become unfamiliar to us. As we walked the formally set out paths through these immaculately kept beds, it was not difficult to feel that we had stepped back two centuries, and that at the end of the row we might chance upon the great teacher himself, with powdered wig and open notebook taking account of the state of flowering in his garden.



Entrance to the chateau Sceaux.

The Gardens of Sceaux

By H. Soulange-Bodin



Pavillon de l'Aurore

About thirty years ago, a mysterious and altogether unknown garden existed behind very high walls bordering the road to Orleans. Its entrance was closed to the public. Then, during the autumn of 1923, the government of France bought the demesne of Sceaux, approximately five hundred fifty acres, situated within five miles of Paris.

Restoration of the property was undertaken. The "grand canal", choked with grass and earth, was recovered and the beauty of its ancient lines brought to light. Next to Versailles, Sceaux is the French park which now receives the greatest number of visitors.

Le Notre, the famous landscape architect and gardener of the seventeenth century, designed the gardens of Vaux le Vicomte, the story of which was so aptly related in the March-April issue of "The Garden Journal," about the time Colbert, minister during Louis XIV's regime, settled in his chateau of Sceaux. So, in 1673, Colbert decided to obtain the services of the celebrated gardener for the development of his estate.

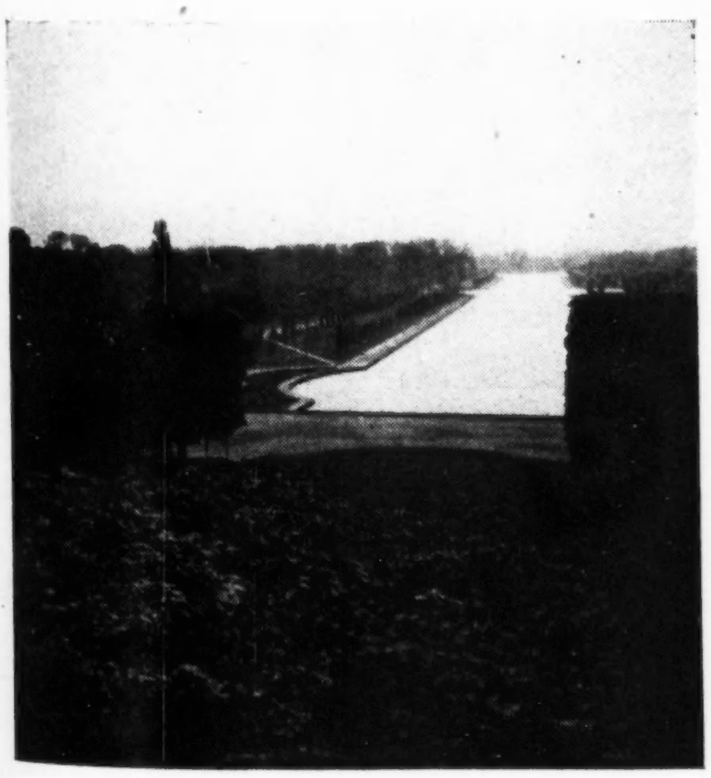
In front of the windows of the palace, there was a long narrow plateau stretched out to the left. An army of navvies was put to work to dig up the ten thousand cubic metres, roughly 13,079 cubic yards, needed for the flower gardens, and the undulations of the future *"jardin a la Francaise"*. Soon the walls of the terrace, which was planned to overlook the grand canal, rose up.

For the development of ponds, cascades and water spouts, the neighboring rivers were brought into play and a dam built at the bottom of a little valley. Near the "grand canal" a large pond of geometrical outlines was created, called the "octogone". Fed by a series of cascades and waterfalls, it was justly celebrated in bygone days. The flower gardens were ornamented with statues carved by such great artists of Versailles as Girardon, Puget and Coisevox.

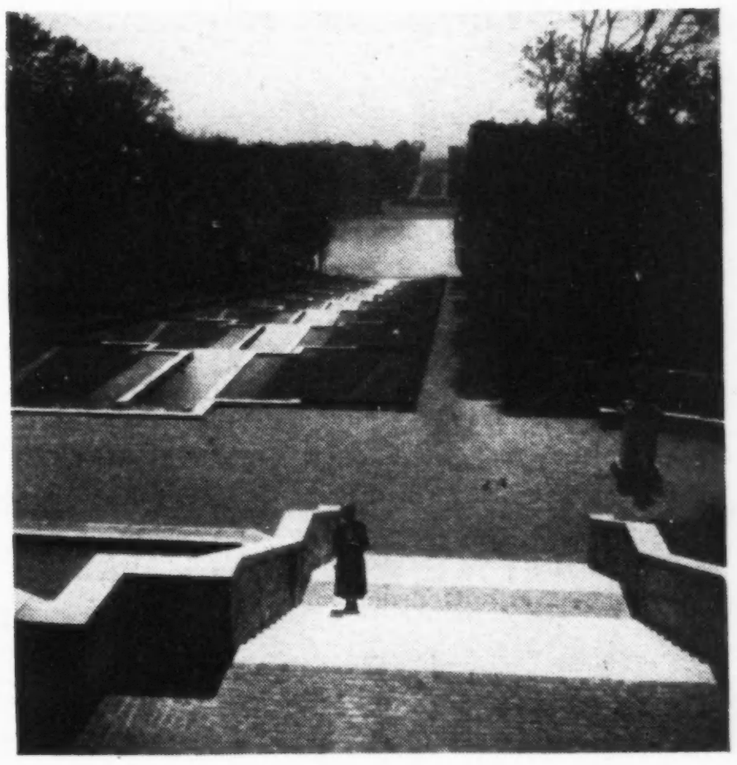
A journal of the seventeenth century, "le Mercure Galant" says: "King Louis XIV after having visited the 'Pavillon de l'Aurore' stopped before the grand 'octogone' just as several gilded and glazed gondolas, adorned with ladies, glided by the king, inviting him into their barque. But His Majesty remained impassive, having eyes only for the wonderful scene of three copious sheets of water falling from terrace to terrace, framed with statues representing tigers, lions and panthers spouting water."

The pavillon de l'Aurore deserves, indeed, a special visit, for it possesses a ceiling painted by Le Brun, the artist who decorated the reception rooms of Versailles and Vaux le Vicomte. The king used to go there to take what might be described as a "cup of tea" but which consisted, in reality, of cool drinks and quantities of cakes. A number of guests was invited—they were permitted to remain outside and admire His Majesty through the windows.

Last autumn, the City of Paris held an exhibition of dahlias in great variety in the lower park running along the "grand canal". The dahlias formed a long carpet of many colors framed in green grass. This June there have been many garden fetes at Sceaux in celebration of the 2000th birthday of the city of Paris.



The grand canal.



The cascades and the grand octogone.

RESEARCH —

At The New York Botanical Garden

By George W. Gray

Most visitors to The New York Botanical Garden probably think of it as a perpetual flower show, but few realize that it is also an active center of biological research. And no wonder, for the 230 acres in Bronx Park contain several horticultural shows rolled into one. There is hardly an indigenous tree, shrub, vine, or spiny cactus missing from New York's collection, and even in the dead of winter the greenhouses are brilliant with the colors of many native blossoms, as well as exotic importations from the tropics.

The director of this perpetual flower show and chief of its research is William Jacob Robbins. At the time of his appointment, in 1937, Dr. Robbins was Professor of Botany and Dean of the Graduate School at the University of Missouri. Before that, he had taught at Lehigh, Cornell, and the Alabama Polytechnic Institute and for two years had served the Rockefeller Foundation as a staff member attached to the European office. Nevertheless, his major interest has always been research, and during his years at Missouri he had been studying factors that influence growth, particularly certain vitamins. But there had also been an increasing burden of administrative duties at Missouri, first as dean of the Graduate School along with his professorship, and then for a year as acting president of the University. The chief inducement that attracted Dr. Robbins to the Garden was the assurance that he would have half his time free for research.

But time was not enough. Unhappily, the appointment did not include much in the way of research funds — actually only $1,500 per year — and soon after he arrived at his new post, Dr. Robbins applied to the Rockefeller Foundation for aid. A grant of $7,000 in 1938, followed by an additional $2,500 in 1939, purchased glassware and apparatus for a new laboratory which was set up in an old carpenter shop. Further support was furnished on an annual basis by the Rockefeller Foundation and soon the botanist was again deep in his study of the growth factors. There is an agreement between the Garden and Columbia University to the effect that whoever is director of the former is professor of botany in the latter, and this joint arrangement gave Dr. Robbins supervision over the work of several graduate students. He excited their interest in the growth factors and soon had a small corps of research assistants.

From these beginnings a notable laboratory has developed and a number of investigations are being supported by grants from several foundations, gifts from individuals, and the income from the Alexander P. Anderson and Lydia Anderson Research & Fellowship Fund, and the Howard Bayne Research Fund of The New York Botanical Garden. One is a study of abnormal plant growth, to see if the tumors which afflict the vegetable kingdom can throw light on the cancers which afflict human bodies. Another is the study of those sudden changes, called mutations, which spontaneously occur in cells and alter their growth patterns.

Then, there is a nutritional study which has been under way ever since the laboratory was established — an inquiry into the hidden factors which influence growth. It is a matter of common experience that many fungi which flourish in a natural medium, such as malt extract, will languish and perhaps die if grown in a synthetic medium, even though the latter has been supplied with all the essentials for growth which are now known. The problem is to find what the malt extract has that the synthetic medium lacks.

Still another project, and the largest one, has to do with antibiotics, the factors produced by plants which inhibit the growth of microorganisms. There are hundreds of antibiotics, for many bacteria, fungi, and higher plants have the faculty of secreting these organic chemicals. Unfortunately most of the antibiotics are so poisonous to man, or are so insoluble in the body's fluids, or are so neutralized by factors in the bloodstream, that they are useless for medicinal purposes. In fact, since the discovery of penicillin (1929), only four others have proved suitable for fighting infectious diseases in man and have come into general use: streptomycin (discovered 1944), chloromycetin (1947), aureomycin (1948) and terramycin (1950).

Experiments on antibiotics effective against bacteria and fungi were launched at The New York Botanical Garden in 1944. Later, the National Foundation for Infantile Paralysis consulted Dr. Robbins regarding the advisability of testing plant secretions for an antibiotic against virus diseases, the hope being that this might lead to the discovery of a drug lethal to the virus of poliomyelitis. It was decided that the most promising field for exploration was the bacteriophage, or phage, the virus that preys upon bacteria. Bacteria are so small as to require little space for housing, and they grow so rapidly that the results of an experiment can be checked within a few hours. Therefore, it was felt that the action of the phage (the virus) on the bacteria (the host) provided an especially convenient criterion for the proposed search.

The next problem was to get a

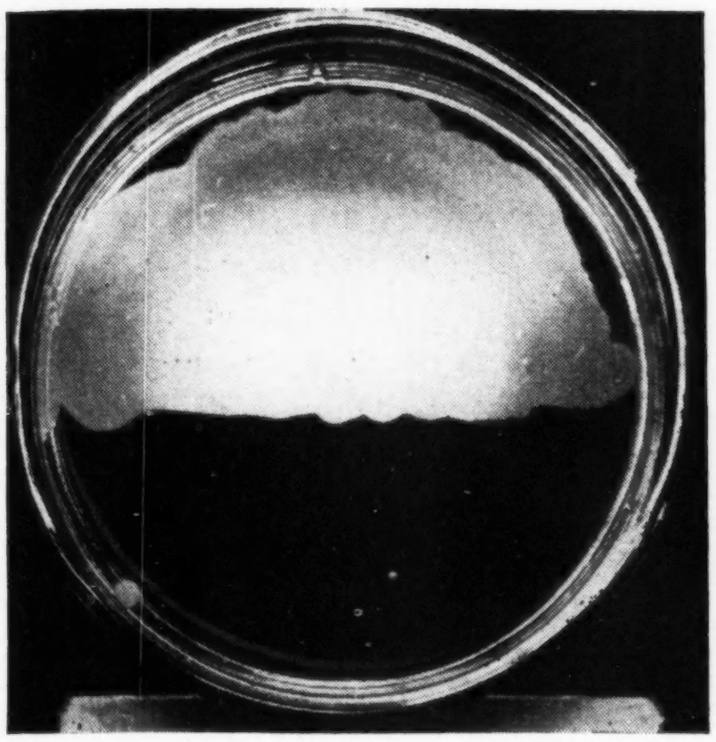
specialist to conduct the study. He was found at the University of Western Ontario in the person of Igor N. Asheshov, a bacteriologist who had already been working on antibiotics against phage. The National Foundation for Infantile Paralysis made a grant which enabled Dr. Robbins to bring Dr. Asheshov to New York and set him up at the Botanical Garden with adequate laboratory facilities. Dr. Asheshov arrived in June, 1948, bringing two assistants, Freda Strelitz (chemist) and Elizabeth A. Hall (bacteriologist), and within a few months the group had expanded to nine full-time workers and one half-time.

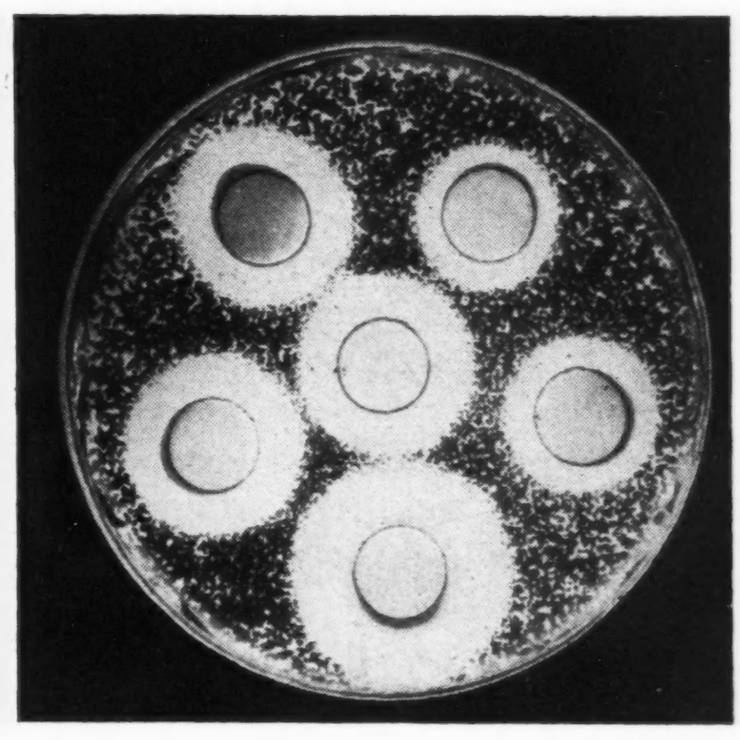
Dr. Asheshov and his group have been investigating sixty varieties of phage. Some are active against streptococcus, others against staphylococcus, still others against the bacillus coli. In effect, each of these phages represents a specific virus disease to which the bacterium is prey, just as certain cells of the human body are prey to the virus of polio. The question is: Are there any antibiotics to which the phages are susceptible? Are there any substances produced by a plant which will stop the ravages of the phage, just as penicillin stops the ravages of the bacterium?

The answer is Yes. Dr. Asheshov and his assistants have found two substances produced by a species of the fungus, *Aspergillus,* which stop phage action. One of these antibiotics is effective against the phage which besieges staphylococcus, the other against that which destroys streptococcus.

The technique for testing these substances is interesting. A small flat glass receptacle known as a petri dish is used as a home for the bacteria. First, the inside of the dish is coated with a nutrient medium which quickly hardens to the consistency of candle-wax. Then, on top of this transparent film, the bacteria are planted along with a minute inoculation of the phage. The bacteria begin to multiply, as can be seen in a few hours by the clouding of the film. But soon spots of transparency begin to appear here and there, indicating localities where the phage is wiping out the bacteria. Left alone, the battle would be a losing one for the bacteria, for eventually all the cloudiness would disappear as the entire population of bacteria was destroyed.

To upset this uneven fight, Dr. Asheshov soaks a tiny bit of filter paper in a solution of antibiotic and then lays this saturated disc on the surface of the film. Within a few hours one sees a striking effect. A circle of cloudiness has built itself up immediately adjacent to and surrounding the filter paper, showing that the antibiotic has reached out to block the phage and destroy its action, thus giving the bacteria a free field in which to grow. But since the amount of antibiotic is limited, it can penetrate only a certain distance out from the edge of the paper, and beyond this range the phage continues to multiply and to destroy the bacteria. In other words, the petri dish presents a graphic map in epidemiology, with the clear spaces marking the regions where the epidemic of phage is raging, and the cloudy halo showing where the bacteria are living, growing, and multiplying without the handicap of the virus disease.





Left: The white material in the upper half of the petri dish is a heavy growth of bacteria on jelly (agar) containing food. No bacteria are growing in the lower half of the dish.

Center: A mixture of bacteria and bacterial virus (bacteriophage) on agar in a petri dish. The small, dark circles show where the phage has destroyed the bacteria.

Right: Paper discs containing an antiphage substance have been laid on the surface of agar on which the bacteria and bacteriophage are growing. Note that the phage has been prevented from destroying the bacteria around the paper discs where the antiphage substance has spread into the agar.

"Of course, it is a long way from the bacteria's disease of phage to mankind's disease of infantile paralysis," Dr. Robbins has said, "and we are not so fool-hardy as to believe that our present research will turn up an antibiotic against poliomyelitis. But we think it possible that the study may disclose new knowledge of viruses which will open fresh leads toward an understanding of the polio virus. And we hope that out of all these efforts, ours and those of others, there may eventually come the discovery by someone of a chemical compound that will block polio."

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PLANTS called *Weeds*

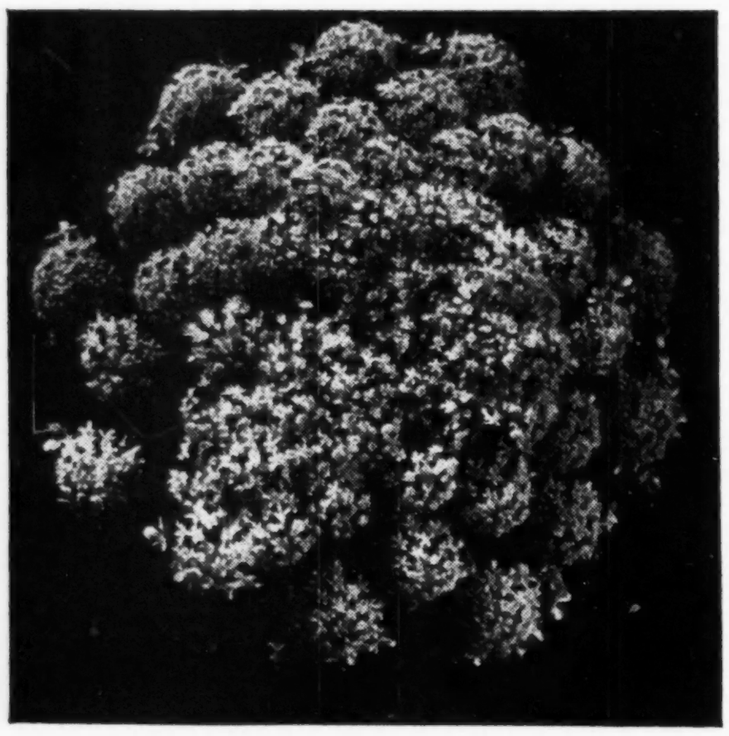
By Jessie G. Fiske

WHAT constitutes a weed? From a botanical standpoint the term is quite general and difficult to delimit because plants which are pests in one region may not be in another. Also they vary widely in their harmfulness. The term has been defined as " . . . a plant which is out of place," or " . . . any injurious or unsightly plant that is at the same time useless or comparatively so." But such definitions do not reveal the noxious characteristics of weeds. Often beautiful, they have interesting habits of growth and methods of propagation, and it is hard to realize that they are actively objectionable. Competing with cultivated plants for water, soil nutrients, space, and light, they are extremely adept at depleting an area of these essentials. They cause millions of dollars of loss annually to farmers and land owners, and often materially reduce crop and property values. Forethought, knowledge, and labor can prevent their growth and spread and the resulting damage they cause.

While a few weeds are found in groups of less structural complexity than the flowering plants (Angiosperms), by far the greatest in number and tenacity form many flowers, long-lived seeds or fruits, and other special devices of reproduction.

Considering the thousands of plants which are weeds, the number discussed here seems inadequate. The necessary selection has been made on the basis of frequency and interest.

The progenitors of some of our common plants possess great antiquity and the forms existing today have survived from a larger and otherwise extinct group of giant species. The common horsetail, *Equisetum arvense,* for example, is a "degenerate" herbaceous type of plant which reached tree-like proportions in the Carboniferous period about three hundred million years ago. Common horsetails start growth early in spring. Their name comes from the bushy appearance given by their green sterile aerial



Queen Anne's lace, which is an eye-catching weed, belongs to the same family as carrot, celery, parsley and parsnip.

stems with whorls of branches at the nodes. The sterile stem connects by an underground rhizome to a yellowish-brown fertile stem bearing a terminal cone. Both stems are readily separable at the nodes and both are furrowed. Their cell walls are rough and contain silica, so the plants have also been called scouring rushes; early American settlers used them for polishing pots and pans.

The reproduction of such species partly explains their general extinction. They have nothing resembling flowers or seeds. In the small fertile cone are produced spores which, when they drop to the ground, form two tiny irregular plates of green tissue (gametophytes) independent of the main plant and of each other. Upon these are borne male and female organs. The passage of the sperm from the male to the female organ for fertilization cannot take place without the medium of water. If water is present and the union occurs, a zygote will develop and the embryo from it will produce both the green sterile bushy shoot and the brown fertile shoot. As water became less available through the ages, the large and once dominant forms of these species disappeared and the present "living fossil" was relegated to restricted areas.

The common horsetail is not too injurious except when quantities are harvested in poor quality hay; it is habit-forming if eaten by horses. The ancestors of this plant, however, contributed generously to the formation of our coal beds.

While prehistoric plants were able to live for thousands of years without seeds, their development was a distinct advantage, and flowering plants — those having true seeds — dominate in world flora today. There are 155,000 species whose seeds have two cotyledons (dicotyledons) and 40,000 species with one cotyledon (monocotyledon) and in modern classification the former are assigned an earlier origin than the latter. However, since space permits discussing but two monocotyledons, they will be considered next.

An unpopular member of the lily family is the wild onion, *Allium vineale.* In many localities it appears with the first grass in spring. Its presence in lawns is undesirable but in cattle pastures it is ruinous to the quality of milk and butter. Meat from animals feeding continuously upon it is unmarketable. Nor is it innocuous in grain fields. Its bulblets are too little for easy separation from the grain, to which they give a strong odor and taste.

Wild onion plants, from six inches to three feet tall, spring up from bulbs the size of small cultivated onions. The thin leaves are dark green, fleshy, and hollow. The dense flower clusters are pinkish-white, consisting of twenty or twenty-five separate flowers. From them develop bulblets, while the underground bulbs produce secondary bulbs. The wild onion is a very old plant, often referred to in biblical and ancient literature. In fact its present name is derived from *Allium,* the Latin word for garlic.

Grasses are usually thought of as valuable, but many are wholly undesirable. Crabgrass or summer grass, *Digitaria sanguinalis,* of doubt-

ful origin, is the worst general lawn pest and is also a plague in potato and grain fields. Growing six to eight inches high, when in bloom it is reddish brown. The flowering spikelets, three to five in number, resemble the spread finger of the hand, hence the name five finger. This grass has a creeping habit of growth, rooting wherever a node touches the ground; it also produces slender seeds which retain vitality for years. The weed should be attacked in autumn when it ceases growth.

Among the dicotyledons are many different mustard weeds. They abound everywhere and have long existed throughout the temperate areas of Europe and Asia. They are short and tall, white and yellow in bloom, coarse and fine; and most are troublesome. Two ordinary lawn types, common peppergrass, *Lepidium campestre,* and shepherd's purse, *Capsella Bursa-pastoris,* are small tough weeds usually six inches to a foot or so tall with many little flowers and inconspicuous seed pods. A common early mustard is yellow rocket, *Barbarea vulgaris,* so prevalent that in the East whole fields turn yellow in the spring. Three others are wild radish, *Raphanus Raphanistrum,* charlock, *Brassica Kaber* var. *pinnatifida,* and black mustard, *Brassica nigra.* These three have either pale or bright yellow flowers and are pests to the farmer.

From some of the larger wild mustard species come leaves for pot herbs but, unless picked when young, they prove too pungent for consumption.

While the mustards are despised as weeds, few families have yielded as many useful plants — cabbage, turnip, radish, cauliflower, rutabaga, broccoli, brussels sprouts, kohlrabi, watercress, kale, mustard. Most of the cultivated varieties are vegetables, but the seeds of the wild form, *Brassica nigra,* furnish spice mustard and prepared table mustard — and what would the American public do without its garnish for hot dogs?

Common and mouse-ear chickweeds, *Stellaria media* and *Cerastium vulgatum,* are tenacious little weeds of lawns and gardens. While the two differ quite markedly, they are also easily confused. Both belong to the *Caryophyllaceae.* The common chickweed is both a summer and a winter annual, while the mouse-ear chickweed is a perennial reproducing from underground rootstocks as well as from seeds. The flowers of both plants are small and white. Each produces tiny vital seeds in profusion. In some areas, particularly where the desirable crop plants are large, neither weed is too annoying, but in lawns, gardens, strawberry or asparagus beds they are vexatious. The common chickweed is occasionally used for greens. Since

The cosmopolitan Composite family includes the giant ragweed, all too well-known as a hay-fever plant.

chickweeds have grown prolifically for ages in all temperate regions, their origin is practically impossible to trace.

Purslane, *Portulaca oleracea,* known to old-time gardeners as pursley, is a small prostrate fleshy herb often found in vegetable gardens and flower beds. It grows in the form of a spreading rosette and the stems and leaves have a reddish cast. The tiny bright yellow flowers, borne mostly on the ends of the branches, open only in sunshine. They produce many seeds and the weeds are a nuisance because, unless raked up after being pulled, they easily take root again. Purslane is often prepared as cooked greens and has a rather pleasing mild flavor. This weed is very old and is widely distributed in the temperate regions of Europe and Asia. It is the remote ancestor of our cultivated garden portulacas.

Lambs quarters, *Chenopodium album,* of the goosefoot family is an annual weed of variable appearance, sometimes growing six feet high. The lower leaves, somewhat larger than those at the top, are angular and coarsely toothed, resembling vaguely the shape of a goose's foot, from which the whole family has derived its common name. The upper leaves are linear. All leaves are green above and pale green beneath. The flowers are greyish-green, small, and mealy in texture. Seeds are lavishly produced. Small, round, and dark with a filmy greyish coat, they remain alive in soil for a long time. Lambs quarters is a familiar pest in gardens and tilled fields, and frequent cultivation is required to destroy it. Belonging to the same family as beets, spinach, and chard, this weed is prized as a table green and its larger leaves can be successively plucked. It seems that this plant came to us originally from the Mediterranean area.

Sheep sorrel, *Rumex Acetosella,* of the buckwheat family is a common perennial weed with slender stems, six to eighteen inches in height, arising from plentiful creeping rootstocks. Its many basal leaves are hastate. The small flowers are greenish-yellow at first, turning reddish as they mature. They are of two kinds, male and female, carried on separate plants. Seeds of great vitality are produced in quantity. So this plant, as well, reproduces in two ways—by seeds and by the perennial rootstocks. Sheep sorrel, also called sour grass or sour dock, is frequently eaten raw. Its presence to any great extent indicates that the ground is acid and deficient in lime. Undoubtedly, our common field weed came from central Europe, where an allied species, *Rumex scutatus,* is cultivated quite generally for soups and salads.

Three plantain weeds infest our lawns. Two are broad-leaved types, common plantain, *Plantago major,* and Rugel's plantain, *Plantago Rugelii.* The Rugel's plantain is the larger and has crimson-based petioles to its leaves. The third is the lance-leaved species, *Plantago lanceolata,* also call-

ed English plantain. The leaves of all three types, dark green above and pale green beneath, have heavy ribs and smooth margins. The dull-hued flowers grow on long slender stalks which give endless trouble when the lawn is mowed; the mower slips over them without cutting them off. The fibrous clustered roots absorb much moisture and food, and the spreading leaf growth crowds out the surrounding grass. The species of this family possess little economic value, although the American Indians and early settlers are supposed to have found the bruised leaves effective for insect stings and bites. One species, *Psyllium,* produces mucilagenous seeds used as a laxative and for poultices. The plantains were native to Europe but spread so rapidly to America that the Indians sometimes called them the "Whiteman's foot."

The members of the parsley family are numerous rather coarse plants distributed widely throughout the north temperate regions of the world. The broad flowers are borne in flattish umbels. A prevalent and eye-catching weed, predominantly white in color, is wild carrot, *Daucus Carota,* usually called Queen Anne's lace. It is a biennial, producing only a rosette of deeply cut leaves the first year and the flower stalks and blossoms the second year. As the fruits mature they bend toward the center of the head. Each is fringed with hairs to catch the wind by which they are widely disseminated. The leaves and stems of the wild carrot are covered with hairs and when bruised exude an unpleasant odor and bitter juices. Animals will not eat them if they can avoid it. The plant's deep tap-root depletes the soil of nutrients, and altogether it is looked upon as a harmful weed. However, other members — garden celery, parsley, parsnip, carrot, anise, and caraway — are of economic importance; and the myrrh of biblical times as well as Socrates' hemlock probably belonged to this family.

The vast cosmopolitan family known as the *Compositae* includes hundreds of annual and perennial herbs, shrubs, and even trees. They have developed almost every form and habit of which plants are capable. Some grow in deserts, some are aquatics. They are found in arctic and tropical climates, in lowland and alpine areas. The small flowers are in few- or many-blossomed heads which generally pass as single flowers. The complexity of these plants makes them difficult to classify and therefore the large group has been divided into subfamilies, tribes, and further subdivisions of genera and species. Of the ragweeds, giant ragweed, *Ambrosia trifida,* and especially the common ragweed, *Ambrosia artemisiifolia,* overrunning fields and roadsides, are all too well known as hay-fever plants. These weeds grow quite erect and their feathery appearance is due to their deeply-cut, dark green leaves and inconspicuous finger-like spikes of small greenish-yellow flowers. The flowers are of two sexes, the male or pollen-bearing ones borne at the stem tips and in the axils of the upper leaves, and the female flowers growing in lower axils.

Another prolific tribe of Composites, commonly called thistles, include many noxious weeds such as the bull thistle, *Cirsium vulgare,* and Canada thistle, *Cirsium arvense.* Both these persistent weeds greatly hamper farming. The former is biennial, the latter perennial, and both are irritating because of their sharp spines. The flowers are lavender or purple, quite fragrant, and much frequented by bees. Upon fertilization, numerous achenes develop which are wind-carried by fluffy hairs called a pappus. The main center from which these plants originally spread was the Mediterranean region. A favorite old-fashioned garden flower derived from this tribe is the bachelor's-button or cornflower. The delectable artichoke with its thick involucral bracts is eaten before the head opens. The common burdock, *Articum Lappa,* is another well-known member of the group.

The lettuce or chickory tribe of Composites is sometimes regarded as a separate family. To this group belong many plants with strap-shaped or ligulate flowers and bitter milky juice, such as chickory, the root of which is grown for use as a coffee adulterant, and endive, a valued salad plant. The cultivated species of lettuce, of which there are more than one hundred, belong to this tribe. But the sturdy little dandelion, *Taraxacum officinale,* is a prize member of the group.

Wherever man has gone he has taken the dandelion with him until it is now established throughout the world. Once arrived, it can subsist almost anywhere. Its deep tap-root, its flat spreading leaves which crowd out all adjacent vegetation, and its highly developed reproductive methods have greatly facilitated its distribution. What is usually called the flower is actually a cluster on a smooth hollow stalk. They open fully only on clear bright days and they close at night. Fertilization by bees, which reach many flowers in one short visit, initiates the formation of many achenes which function as seeds. The achene, thin, tan in color, toothed at the lower end, is equipped with a noticeable white pappus. This pappus is umbrella-shaped and in a high wind it spreads like a parachute. So delicate is the balance between the pappus and the achene that the whole structure sails along with the breeze, often swept high in currents of air and carried many miles. In its descent it resembles nothing so much as a paratrooper slowly drifting to earth. This intriguing method of dispersal, together with the dandelions' hardiness and ability to dig in, makes them almost impregnable inhabitants of the vegetative world.

WATER-LILIES

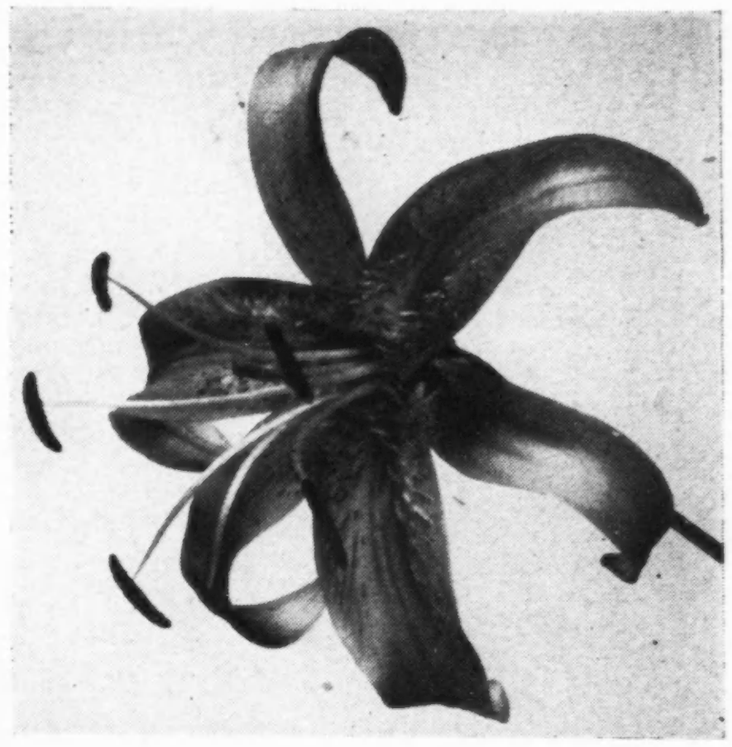
The pools of hardy and tropical water-lilies located in front of the conservatory of The New York Botanical Garden attract many visitors during the summer. Water itself has a restful and cooling sensation on a hot, humid day, and the forms of the individual flowers which grace the surface of the pools are very beautiful, their colors enchanting. The colors are mostly soft pastels, but occasionally there are darker blues and reds.

The flowering period of the hardy varieties which began in June, will last until September; while the tropical kinds which come into bloom this month will continue to flower until frost. Hardy varieties may be left outdoors all year, if the tubers are placed below frost line; but the tropical varieties must be lifted and kept in the greenhouse during cold weather. In the vicinity of New York City, they are moved into the pool usually about the middle of June.

(*Continued on page* 116)

Progress — in Lily Breeding

By George L. Slate

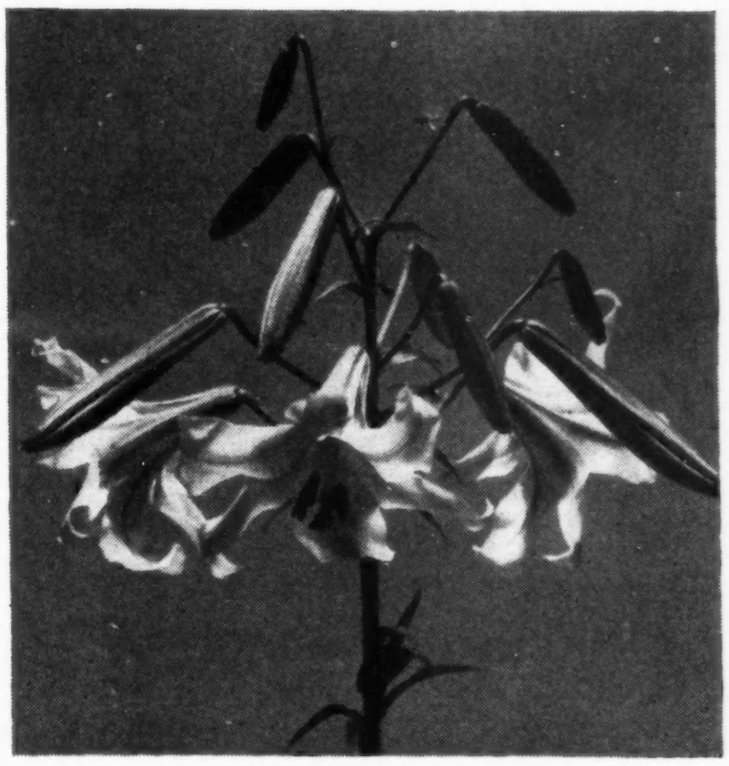


Aurelian Hybrids — in this new race of lilies the flowers may be bowl-shaped, widely flaring or slightly reflexed.

THE gardener and the plant breeder have both discovered that lilies pay tremendous dividends of pleasure to all who grow them. No other genus of hardy herbaceous plants equals the lily in ornamental qualities. As a group, lilies are unsurpassed in variety and richness of color, diversity of form and long season of bloom. The bulbs are hardy and need not be dug up for winter storage. The difficulties of the past, which were chiefly pathological, are gradually being overcome by research on lily diseases and the development by the breeder of hybrid clones and strains better suited to garden conditions. The wide range of colors and forms, existing among the wild lilies of the world, is being greatly extended by hybridization, and yet the field has scarcely been touched.

The lily breeder of today has many advantages not available to the breeder of thirty years ago. He has the lilies of the world in many species and varieties readily available to him through the rapid communications of the present day. Much hybrid material is available to stimulate him and make possible many lines of breeding that could not be undertaken in the past. The lily literature of the last thirty years is replete with suggestions for the alert breeder.

Research agencies have developed methods of overcoming the cultural troubles that made the work of the older breeders so difficult and discouraging. Of tremendous value is the work on disease control. The fine hybrids of the past, except *Lilium testaceum,* were nearly all destroyed by disease soon after their origin and there remained only published descriptions of their beauty to tempt other breeders to repeat the crosses with the same sad results.



***Lilium centifolium* Olympic Hybrids are a modern strain of trumpet lilies for July flowering.**

Our present knowledge of virus diseases of lilies is sufficient, if fully utilized by the breeder, to make it possible to produce virus-free hybrid lilies and work up healthy stocks for introduction. Isolation and the use of cloth houses to bar the virus-transmitting insects from healthy lilies have demonstrated their usefulness as tools of the lily breeder. Systemic insecticides, the possibilities of which are just being investigated, may perhaps play a part in reducing losses from virus diseases by eliminating the aphids which carry the virus from plant to plant. Basal rot, the great destroyer of seedling lilies, has been conquered in part by the use of sterile media in which to start the seedlings. Vermiculite, sphagnum moss and other sterile materials combined with the use of nutrient solutions have not only eliminated basal rot in seed flats, but have made possible unusually rapid growth of the seedlings. Fungicidal treatments for protecting healthy bulbs from basal rot and cleaning up diseased ones have been devised. Soil sterilants have been developed for destroying the fungus in infected soils. Sprays are available to control botrytis, a serious disease of Madonna and other lilies.

New techniques for the rapid propagation by scales have made it possible to build up large stocks of new lilies and disseminate them widely, before they become infected with disease.

Growth-regulating substances are being used to bring about difficult crosses that might not be readily effected by ordinary techniques. Colchicine treatments have given rise to tetraploid lilies with larger flowers and better substance. In some cases, these tetraploids may be used to better advantage in breeding than their diploid parents. The parentage of hybrid lilies may be determined, in some cases, by comparing their chromosomes with those of their putative parents. Research on methods of pollen storage has made it possible to store the pollen of early-blooming lilies for use on late-blooming species or even to carry over until the following season the pollen of late-blooming lilies to be used on the early-blooming species that year.

Lily breeding requires a knowledge of the botanical relationships and the geographical distribution of the lilies of the world. The hit or miss crossing of any two lilies that happen to bloom together is not productive of worthwhile results. Generally speaking, the lilies of any one region do not cross readily with the lilies of another region. Thus, the lilies of the Pacific Coast region of the United States cross only with themselves. The Asiatic species, too, tend to mate chiefly

Parade, a Mid-Century hybrid, has broad petals of yellow-orange spotted with dark maroon or black.

with their geographical relatives, although there are occasional exceptions. With this in mind, we come to a discussion of what has been done in the past, what is being done now, and predictions as to possible future developments. The situation is easier to understand if each group is presented separately.

THE TRUMPET LILIES. The Regal lily, *L. regale,* is the best known species of this group. Its arrival on the scene in the early years of this century and the discovery that it could be raised easily from seeds did much to stimulate the present boom in lilies. A chance hybrid with *L. Sargentiae* soon appeared and a few years later Miss Isabella Preston raised several of the same parentage. *L. sulphureum* soon became involved and later *L. leucanthum centifolium.* In the thirties, seedling strains involving these species began to be produced on a large scale and these are now on the market. Superior clones are being propagated vegetatively for introduction as named varieties and many of the better ones are being segregated as parents to improve the strains. Pink-flowered strains have been developed from occasional seedlings which showed some pink on the interior of the petals. Yellow-flowered strains are being raised.

More recently, the crossing of *L. Henryi,* an Asiatic Martagon with reflexed petals and orange and yellow-flowered varieties, with *L. Sargentiae* and *L. sulphureum,* has introduced great variation into this group. It is too early to predict what will ultimately evolve from the very extensive breeding work now being done in this group. Pure yellow, orange, ivory and cream-colored types in all shapes from Martagon to the largest of trumpets may be expected. This group will be of the easiest culture, winter hardy, probably tolerant of virus diseases, little troubled by other diseases and in various clones will bloom from late June through August. Many will be propagated rapidly and cheaply by bulbils. This group is destined to go far in American gardens.

L. DAVIDI VAR. L. WILLMOTTIAE GROUP. *L. Willmottiae,* as gardeners usually call it, has been a valuable species for the breeder, and many fine and easily grown lilies are numbered among its descendants. Miss Preston and Dr. Skinner have both crossed it with upright-flowered lilies of the *elegans — umbellatum* group. Miss Preston's cross resulted in that excellent lot of lilies known to lily fanciers as the "stenographer lilies", being named for members of the stenographic staff at the Dominion Experimental Farm at Ottawa, Canada, where the lilies originated. These are very striking, vigorous, easily grown lilies in brilliant reds and oranges. Another generation of seedlings was raised and one, a beautiful clear yellow with reflexed petals, was named Coronation. Other seedlings, which had upright rather spidery flowers, were named after British fighter planes, Hurricane, Spitfire, and so forth.

L. Willmottiae has also been crossed with *L. tigrinum* and *L. croceum* by other breeders. Recently Professor C. F. Patterson, of the University of Saskatchewan, crossed *L. Willmottiae* and some of its hybrids with *L. cernuum* producing, in the first generation, plants with the growth habit of *L. Willmottiae* and the rose-pink flowers of *L. cernuum.* In the second generation, whites, pale creams and cream tinged with pink appeared. This is a

Hollywood Hybrids, with star-shaped flowers, resulted from crossing Preston Hybrids with Mid-Century Hybrids.

very promising line of breeding, as it will result in new colors combined with plants of easy culture. The possibilities of this group are far from being realized.

Many breeders have been raising seedlings of the "stenographers" and a host of red and orange lilies has resulted. At the lily show in Buffalo in 1950, the many hybrids in this group and in the *tigrinum* group gave the show a decided orange and red appearance. Eventually, some good yellows should be produced; but for the time being, we can get along without any more red and orange lilies that are not different from those now available.

THE TIGRINUM GROUP. The tiger lily also crosses readily with the upright-flowered types and with *L. Maximowiczii.* Here again we have many orange and red lilies. The Oregon Bulb Farm of Gresham, Oregon, has gone far with this group and has named a number of varieties, many of them side facing flowers of considerable size and substance and easy to propagate. Lilies of this type may be expected to thrive anywhere that lilies will grow. The crossing of this group with the preceding group should result in a long series of distinct forms and colors, all of the easiest culture.

THE UPRIGHT LILIES. This group, descended from *L. concolor* and *L. croceum,* was well worked by the Dutch and others many years ago. It is not likely that intercrossing these varieties will result in any startling new forms. In crosses with the preceding groups, they may be expected to make worthwhile contributions to the variety list.

THE CANDIDUM - CHALCEDONICUM GROUP. This, in the writer's opinion, has more real quality than any other lot of lilies. *L. candidum,* the Madonna lily, is one of the most beautiful of all garden plants. Its hybrid with *L. chalcedonicum, L. testaceum,* light apricot, with recurved petals is scarcely less beautiful. Hybrids of *L. testaceum* and *L. candidum* vary from white through white faintly tinged with green to ivory and the apricot of *L. testaceum.* Some are side-facing and some nodding. Hybrids of *L. testaceum* and *L. chalcedonicum* vary from apricot to bright deep red. This group is plagued by susceptibility to basal rot; but when this disease is conquered, few lilies will excel in beauty the hybrids that can be developed from these two species.

Serenade, with clear orange flowers, is a fine garden lily, one of the Mid-Century Hybrids.

The Madonna lily itself has been improved materially in number, placement, size and texture of flowers in the Cascade strain now on the market. We may soon expect the best of these to appear as vegetatively propagated clones.

THE AURATUM-SPECIOSUM GROUP. These are the most gorgeous lilies of all and although Francis Parkman, the historian, flowered the first hybrid of these species in 1869 and several more have been produced since then, all have perished except a recently produced hybrid in Australia. The writer has flowered over twenty-five hybrids of these two species and a number of second generation seedlings. The hybrids bloom with *L. auratum* and bear flowers about the same size but with less reflexed petals than those of *L. speciosum.* Vigorous use of existing material by breeders should endow our gardens with as handsome a group of plants as can be imagined.

(*Continued on page* 118)

Drought-resistant, Golden Chalice Hybrids are suitable for a sunny, dry corner of the June border.

A NEW TWIST

TO THE DOUBLE CROSS

By Herbert L. Everett

THERE'S one type of double cross which is carried out many times every year, in many sections of the world, and the net result benefits all concerned; this is the double cross of hybrid corn. Most everyone knows a little bit about the way in which hybrid corn has revolutionized production of the most important crop in American agriculture. Fabulous figures speak of a billion dollar gain to America during the years of World War II — a gain due entirely to the extra crop yields of corn hybrids. In a monetary sense, the gifts of controlled heredity are indeed fabulous; in another sense, they are priceless, for these giant corn crops have permitted us to maintain the high standard of diet always associated with the United States and simultaneously have allowed us to send food to our destitute friends abroad.

Yes, most of us are conscious to some degree of the benefits derived from hybrid corn, but how many know the intriguing story of the men who brought about this double cross of the nation's bread basket; and how many know the newest development which bids fair to increase the value of hybrid seed with no increase or even a decrease in production costs?

Our increased corn production of World War II stems directly from some "Ivory Tower" research, which was carried on prior to and during the hectic days of the first World War. Scientists associated with these early studies have been justly toasted in many review papers concerned with hybrid seed corn and its many practical and theoretical implications. A book entitled *The Hybrid Corn Makers — Prophets of Plenty* completes the picture of this modern saga of agriculture. Names such as Shull, East and Jones have become synonymous with pure line breeding, hybrid vigor or heterosis, and the double cross method of hybrid seed production.

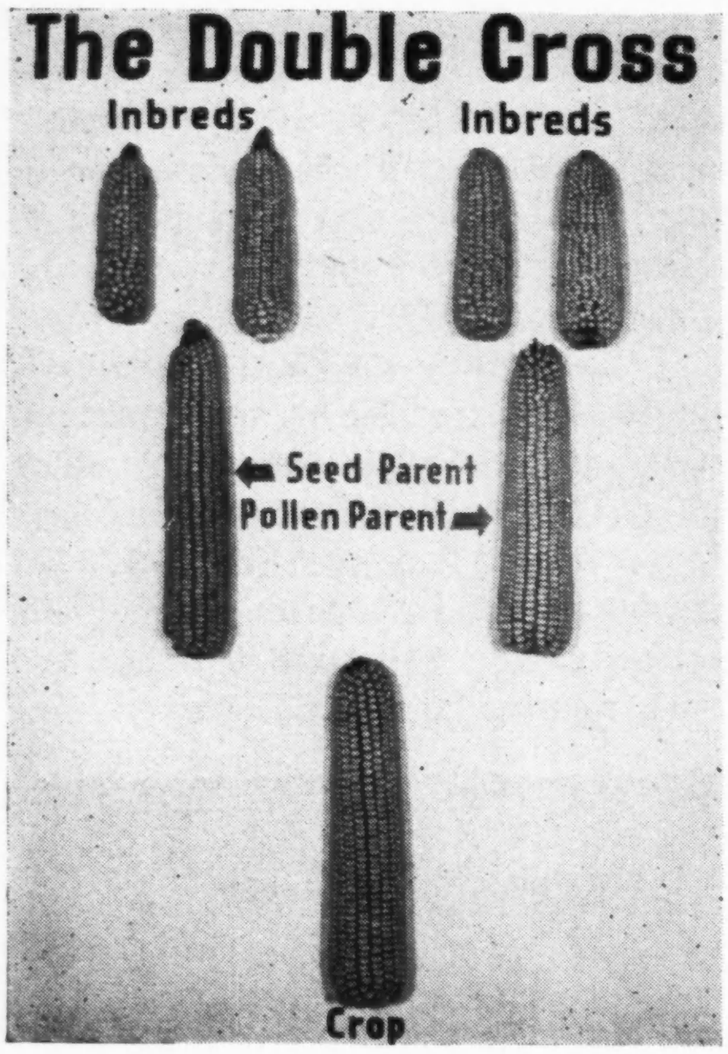


Fig. I illustrates the vital mechanism of the hybrid process.

The double cross method was formulated in 1917 and completed the jigsaw puzzle of practical hybrid seed corn production by fitting bits of theoretical knowledge, indicating tremendous productive capacities of inbred crosses, into an acceptable set-up. Simply, this method demands the use of four diverse maize inbreds selected from selfed lines originally chosen out of the old standard corn varieties. Since every corn plant has both male (tassel) and female (silks) elements, selfing merely means that pollen from the tassel of a given plant is placed on the silks of the same plant. Multiply this process thousands of times and you have the beginning of an inbred selection program. Kernels from these selfed ears are isolated and planted in a single row and further selfings and selections for desirable plants are carried out. After several generations, complete uniformity of type is achieved and the breeder has "inbreds" with which to work.

Two such inbreds may be designated A and B. The cross of A times B (pollen of A on silks of B — or vice versa) results in a single cross. Yield studies quickly show which single crosses have maximum vigor. Good single crosses show tremendous hybrid vigor which has been nicknamed "heterosis". To produce seed cheaply and in sufficient amount, it has been found necessary to cross again one single cross with another single cross of different constitution. In other words, A x B must be crossed by C x D. In actual corn ears, this vital mechanism of the hybrid process may be represented as in Figure I.

Vast acreages are required each year to produce the hybrid seed, which now represents over 75% of all corn seed planted and practically 100% of the seed planted in the corn belt, our greatest production area. To produce this seed in the same way that the plant breeder carries out his selfing and selection program is not feasible. The breeder controls his pollinations through the use of paper bags. One bag is placed over the tassel to catch the pollen as it is shed; a second smaller bag is clipped over the developing ear shoot before any of the silks are exposed. When the silks are out, pollen from the tassel bag is shaken on to the silks and the fertilized ear is covered once again. The ear remains under cover until its kernel development is complete, at which time the ear is harvested.

Such a laborious, costly and time-consuming job could not be justified in any practical seed production program. Instead, large but well isolated fields are carefully picked out and here the single crosses are planted. The cross which is to serve as the female or seed parent is planted in two, three or four times the number of rows as the pollen source or male parent. These plots are grown simi-

Fig. II. A field of corn with fertile seed parent detasseled.

larly to field corn being raised for grain or ensilage on any good farm until the stage of tassel emergence is reached. Then, large numbers of men and machines move through the fields, pulling out the tassels from all the plants in rows previously designated as female or seed parent rows. This is the breeders' paper bag technique transposed into mass production. One such detasseled crossing plot is shown in Figure II. Although detasseling is far less expensive than the use of bags, the cost is still highly significant and manpower requirements are large.

In the critical period facing American industrial production and armed might, the availability of transient personnel to carry out detasseling may prove to be the limiting factor for the hybrid seed corn industry. Employment on farms, according to U. S. Department of Agriculture and Department of Labor data, is at a fifty-year low. Yet, due to industrial and military requests, it appears that the farm labor shortage will grow worse. Certainly, it is a time when any alteration in operation which could reduce costs and manpower demands would be vitally important. Analogous to the studies in 1917 which culminated in the extra yields of the forties, research begun at an earlier period and continued during World War II has put a new twist in the double cross method. This new ingredient is the sterilization of the male element, or pollen, in the crosses which serve as seed parents, or females, in the double cross set-up. Use of a male sterile trait with controlled heredity has long been the goal of scientists interested in the problems of hybrid seed production. Jones' first hybrid, double crossed Burr Leaming, was a combination of a white seed parent with a yellow pollen parent. It was proposed at an early date to grow these two single crosses in alternate rows, without detasseling, harvesting only the seed ears from the white seeded parental single cross. These ears showed a mixture of approximately one half pure white seeds and one half light yellow seeds. The yellow seed resulted from cross pollination and could be separated from the white inbred seeds by the electric seed grader which was then being utilized for sorting beans and coffee. Thus, only a fourth of the grain produced could be sold as hybrid seed. This fact, coupled with the expense involved, resulted in abandonment of this idea.

A second method was quickly worked out involving an inherited condition of pollen sterility. This sterility factor proved to be closely associated with the common yellow endosperm color. By introducing this sterility in white or yellow seeded inbreds, it was possible to produce a single cross seed parent with most of the tassels completely sterile. Once again, however, the necessity of separating seed on the basis of color occurred. Due to this and other handicaps, the method has never been used in any practical sense.

Use of chemical or physical treatments either to sterilize seed or to restore fertility to male sterile plants has been suggested many times. Again,

Fig. III. A small crossing field utilizing a cytoplasmic male sterile seed parent.

usable ways and means have not been found to date. However, a method has been gradually developed prior to and through the years of World War II, which is now being used successfully at the experiment stations in Connecticut and Texas to produce hybrid corn without detasseling. This new twist of the double cross employs a form of cytoplasmic sterility. Sterility based on the cytoplasmic make-up of a plant shows an inheritance which is quite different from the gene-factors, such as the sterility which was mentioned previously as being associated with kernel color. The gene-factors are located in definite string-like bodies called chromosomes which pass equally well through the female seed element. On the other hand, cytoplasmic factors are outside the chromosomes and tend to follow the female seed element exclusively — pollen contains little or no cytoplasmic material.

Cytoplasmic male sterile corn plants were first described in the 1930's and shortly thereafter an intensive program was initiated in Connecticut to utilize this character in hybrid seed production. The cytoplasmic sterility conditioned all of the progeny from one sterile plant and they were all sterile, too. Moreover, later generations remained sterile, no matter what plants were used as a source of pollen. The original material proved to be quite variable with many throwbacks to partial fertility occurring. New material from other sources was examined and this material proved to be very consistent in maintaining complete sterility. In corn it has been a simple matter to incorporate the cytoplasmic factor in any inbred desired for the seed parent single cross. This sterile inbred is maintained by continuous backcrossing to its fertile counterpart and a special method of selection results in a continuation of complete sterility.

The single cross, in suitable combinations, is also pollen sterile and can be used in crossing fields to complete double cross seed production. Moreover, complete sterility makes certain the purity of the hybrid seed because no contaminating pollen can be shed by the female seed parent rows. A small amount of contamination is difficult to avoid in fields detasseled by the removal of the tassels. This male sterility does not reduce seed production. Indeed, present evidence indicates that pollen-sterile plants may actually produce more seed, due perhaps to the fact that the plants are not injured as is the case when the tassels are pulled. Every leaf that comes away with the tassel reduces the yield of seed appreciably as has been clearly shown in several trials. There is also some breaking of leaves in the detasseling process and infection often enters the plant at the site of tassel breakage. There is even a possibility that some of the energy normally expended in pollen production is diverted to seed production. Figure III shows a small crossing field utilizing a cytoplasmic male sterile seed parent.

The favorable yield capacity of the sterile hybrid is also found in the double cross hybrids which are used by the American farmers. However, there is one important problem inherent in the cytoplasmic male sterility production method. The final double cross is sterile and restoration of pollen fertility must be accomplished if the farmer's crop is to produce the essential grain. This restoration may be brought about in two ways, the first method is simply to produce both fertile and sterile hybrids. Mixing or blending of seed which guarantees that one-fourth of the plants will be fertile allows for normal seed set under usual environmental conditions. In a crossing field there is generally ample pollen where one-fourth of the rows produces pollen, and this pollen has to blow over several rows.

These normal plants can be of the same genetic composition as the sterile plants or may be different. They must, of course, shed pollen at the right time and seed of the two types must be produced in a similar manner so that the two lots after mixing will grade alike for mechanized planting.

This blending process is a temporary measure which will fill the gap until pollen fertility can be restored by incorporating genes for pollen fertility in the male pollen parent. Inbreds, some of which are of commercial importance, have been discovered which in crosses with sterile lines restore fertility to a degree whereby normal seed set is assured. These pollen restorers are gene factors located on the chromosomes which means that transfer of the restorer factor from one inbred to another will be more difficult and time-consuming than introducing the cytosterility factor into an inbred. Soon, however, the double cross will be produced without detasseling through the use of cytoplasmic sterility and normal pollen production will be assured by restorer gene action.

Thus, the newly designed double cross, thanks to scientific research, plus the perseverance of far-sighted men in both experimental and applied fields of agriculture, bids fair to increase benefits for all. No one complains when agriculture in America and throughout the world continues to be double crossed in such a desirable manner.

Water-Lilies

(*Continued from page* 110)

Tropical water-lilies include night-blooming ones, as well as day-blooming. Those which bloom at night open the flowers between 7 and 8 o'clock in the evening and close them between 9 and 12 o'clock the next day. Among the notable varieties in the pool at The New York Botanical Garden are two with attractively mottled leaves — Cleveland, which has clear pink flowers, and zanzibarensis, which has rich rose-pink flowers. The white flowers of Mrs. George H. Pring, the reddish-purple of Panama Pacific, the clear blue of Colonel Lindberg, and the pink of General Pershing also command admiration.

Varieties of hardy water-lilies that have been grown over a period of years at The New York Botanical Garden include the cup-shaped crimson James Brydon; the deep red Sirius — its deep green foliage is spotted with purplish brown; the delicate lilac-pink Formosa; and the sulphur-yellow, doubled-flowered *Nymphaea odorata sulphurea grandiflora*.

Water-lilies have played a prominent part in the art of landscape gardening since early days, and have been employed in European gardens from the elaborate and formal pools of the sixteenth century through the simple naturalistic pools of later English gardens under the influence of Repton. Today water-lily pools, both formal and naturalistic in design, adapt themselves to modern American gardens.

Four New Daylily Clones

By A. B. STOUT

SINCE 1947, the selections of the seedlings of *Hemerocallis* that were developed at The New York Botanical Garden have been grown by the Farr Nursery Company of Weiser Park, Pa., for further evaluation and propagation. Four of these are herewith given horticultural names and will now be distributed for general use in gardens.

AUTUMN MINARET DAYLILY. This seedling is a hybrid of a plant of *Hemerocallis altissima* and a plant of *H. fulva*, both of which came from China. The foliage is dormant in winter and the plants of the clone are fully hardy in northern states. The scapes are well branched and often five and a half feet tall. The flowers are decidedly day-blooming, of medium size; their coloring is golden in the throat and the petals and sepals are overcast with bronze-red that is strongest in the mid-zone. The period of bloom extends from early August until late September.

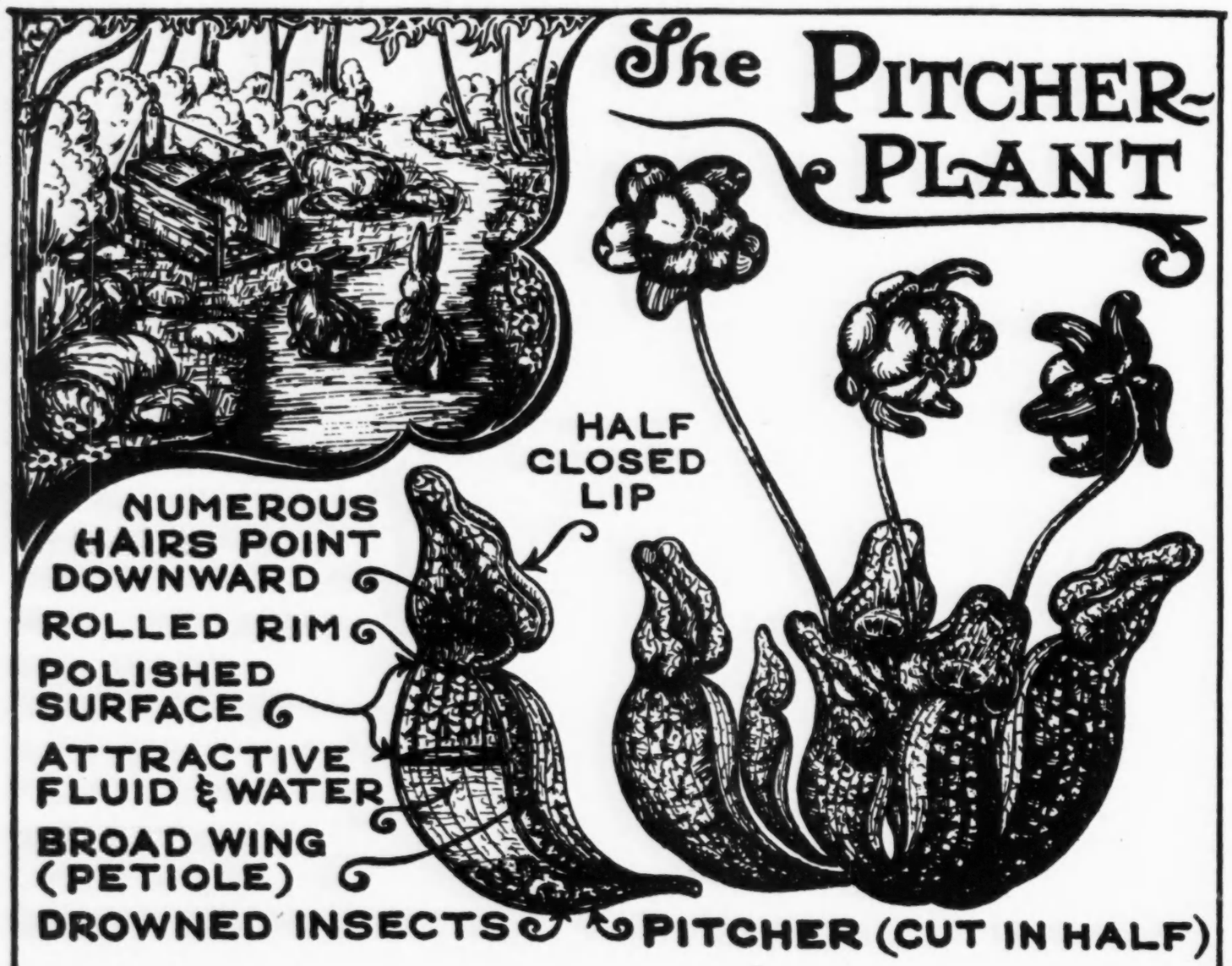
SUN DUST DAYLILY. This clone has an evergreen habit. The stiff erect scapes reach a height of forty-two inches. The flowers are large, with a spread of five and a half inches, and very full with broad overlapping segments. The general or ground color is golden-yellow; the blades of petals and sepals are delicately sprinkled with brownish-red that is somewhat stronger on the sepals. The season of bloom is in July.

COPPERPIECE DAYLILY. The sturdy and much branched scapes of this clone stand slightly above a mound of attractive evergreen foliage. The flowers are full, about five and a half inches in spread; the throat is a rich golden-orange and there is a delicate blend of coppery bronze in the blades of petals and sepals, that is somewhat more intense in the mid-zone of the petals. The pastel and coppery color effects in the flowers are not matched in any other of the introductions from The New York Botanical Garden. The bloom period extends from early July to mid-August.

Upper Left: Daylily Sun Dust.
Upper Right: Daylily Royal Ensign.
Above: A healthy plant of daylily Copperpiece.

ROYAL ENSIGN DAYLILY. This clone has excellent evergreen foliage and scapes that are nearly three feet tall. The habit of growth is much like that of its sister plant, the Copperpiece daylily. The flowers are large and full with recurving segments. The throat is golden-orange and this color extends in a stripe along the mid-veins of the petals. The blades of the petals are a rich maroon-red, but the sepals are somewhat lighter in color. The plants are low-growing and compact and the large, dark red-and-gold flowers form a canopy of bold color on the crest of the foliage. The period of bloom is from early July to mid-August.

PLANTICS



How could such an interesting and striking plant be up to any "antic"? Nevertheless it is, for just as we would set a box trap to catch animals, the pitcher plant sets traps to catch its prey, then kills and eats it. This odd plant grows in marshy ground, where the soggy soil does not contain sufficient sulphur and nitrogen essential to its growth. Therefore, it extracts this necessary food from the decomposed bodies of the insects it catches in its traps — the pitchers. These pitchers are leaves, the margins of which have adhered to and grown up around a central-standing petiole. This petiole is a flattened, wing-like structure. "The Architect" who designed it, definitely patterned it after a flying-buttress, for it is really an arched brace for strengthening and supporting the pitchers when they are filled with water. In studying one of the little pitchers, we find that the upper portion of the inside is covered with numerous hairs, which point downward. These hairs exude a sweet, sticky fluid which lures insects within.

Once an insect is within this "sweet-shoppe", he learns too late that he has entered a death chamber. It is easy for an insect to crawl down and over the hairs, which bend readily, only to snap back in a position to prevent its escape. Even if it attempts to fly vertically, the half-closed lip is there to end the flight. Bewildered, and in despair, it falls — into the life-taking liquid below. The polished surface of the side-walls, just above the water level, affords no foothold.

Hundreds of small insects, especially ants, drown and are found decaying in the bottoms of the pitchers. While the liquid possesses something of an attractive nature to insects, most human beings find the odor offensive.

Cruel as the "antic" of this plant may seem, it does help to dispose of undesirable insects.

MAC KEEVER

Progress in Lily Breeding

(*Continued from page* 113)

THE MARTAGON-HANSONII GROUP. The yellow Asiatic *L. Hansonii* was first crossed with the Martagons, which range in color from the pure white of *L. Martagon* var. *album* through the dull purplish pink of the type to the deep wine-red of var. *Cattaniae*. *Marhan* and *Dalhansonii* were raised in the early nineties and about that time Mrs. R. O. Backhouse originated the series of fine varieties usually known as the Backhouse hybrids. These are tall, stately, shade-loving lilies of great beauty, very distinct from the other species. They are usually fairly free from mosaic, but many are susceptible to basal rot. The breeder can go far with this group.

THE PACIFIC COAST GROUP. The west coast of the United States and adjacent Canada is the homeland of fourteen species of lilies, most of which do not take kindly to gardens away from their native land. They mate only with each other. Luther Burbank once raised acres of hybrids of the West Coast lilies, but they are all gone. David Griffiths raised the Bellingham hybrids, a series named for the town where the United States Department of Agriculture bulb station was located in the state of Washington. These were tall handsome lilies ranging from yellow through orange to red. The yellow Shuksan is still being propagated, but the others are scarce and may not last long. Under the name Bellingham hybrids, a seedling strain of similar parentage is being produced and distributed. Many of this group are handsome and striking lilies, but most of them should not be expected to last much longer than three years in gardens.

LILIUM LONGIFLORUM. This handsome species does not cross with other lilies, but an extensive breeding project, undertaken by Dr. S. L. Emsweller and his associates of the United States Department of Agriculture, has resulted in some outstanding new types of marked superiority to the older varieties once used so extensively in the florist trade.

The Garden's Supporting Cast

EMMA AHLES

By Ruth V. Caviston

Of the thirty-eight gardeners employed at The New York Botanical Garden, three are women. Emma Ahles, mother of seven children and grandmother of five, has been with us since December, 1942. Yet, the second day on the job Mrs. Ahles offered her resignation. She had been assigned the work of cleaning display orchids in the greenhouse. Periodically, the leaves of all our orchid plants are washed with a sponge that has been dipped in a combination of whale oil soap and insecticide. Mrs. Ahles was allergic to the insecticide and by the end of the second day, felt unable to continue. Fortunately, orchids are not cleaned this way every day of the year and there was other work to be done, so Mrs. Ahles stayed.

It was through her son that Emma Ahles became interested in The New York Botanical Garden. After Harry Ahles was employed as a gardener, his mother often came over with his lunch or picked him up in her car at the end of the day. By doing this, off and on, over a year and a half, Mrs. Ahles gradually became acquainted with Harry's co-workers. She found it interesting to watch the men working in the greenhouse. Since gardening had always been one of her favorite hobbies, she was quick to note how the professional gardeners handled plants.

One night when Harry came home from work, he told his mother of a vacancy in the gardening department and suggested that she apply for the position. The idea appealed to Mrs. Ahles, so Harry spoke to his superior. An appointment was arranged for his mother to see T. H. Everett, the Horticulturist. After the interview, there were two Ahles' on the Garden payroll.

Immediately following her unhappy start with the orchids, the new employee was assigned to the propagating houses. These greenhouses are not ordinarily open to the public. Many of our greenhouse plants are raised at the "prop" until they are ready for exhibition, when they are put on display in the main conservatories. At the "prop" Mrs. Ahles crocked pots, watered plants, made cuttings, and performed all the tasks generally given to an apprentice gardener. But orchids still played a role in her career. A fire at the propagating houses necessitated moving the entire orchid collection to the main greenhouse. Mrs. Ahles helped to transfer the plants and was herself transferred to the house in which she had started.

Back in the main conservatories, Mrs. Ahles worked with various plants. From time to time she was called upon, with others, to help in setting up special displays in the greenhouse. Under the direction of T. H. Everett, the Horticulturist, who plans and directs the Garden's special exhibits for winter, spring, and fall, Mrs. Ahles and other gardeners used to set out plants in the positions he indicated.

One spring, due to an emergency, Mr. Everett was unable to give his time to staging an exhibit. He spoke to Mrs. Ahles, explained the theme of the show, gave her an outline of his plan, and asked her to set it up. Approximately fifteen hundred plants were to be used and they varied in kind, size, shape, and color. Mrs. Ahles cheerfully tackled the job and everyone was pleased with the results. From that time, she has worked hard on our exhibits. She is given the general idea of the show and told what "props" will be used. The "props" may be anything from a windmill to a small thatched cottage to a bench beside a tiny stream. A few days before a show is put up, Mrs. Ahles inspects the plants that are to be used. By the time of the actual staging, she knows the general effect Mr. Everett is striving for and how the plants should be ar-

(*Continued on page* 121)

After her first unhappy experience with orchids, Emma Ahles has come to enjoy them.

For the Younger Generation of Gardeners

LET'S TAKE A NATURE WALK

By Dorothy Ebel Hansell

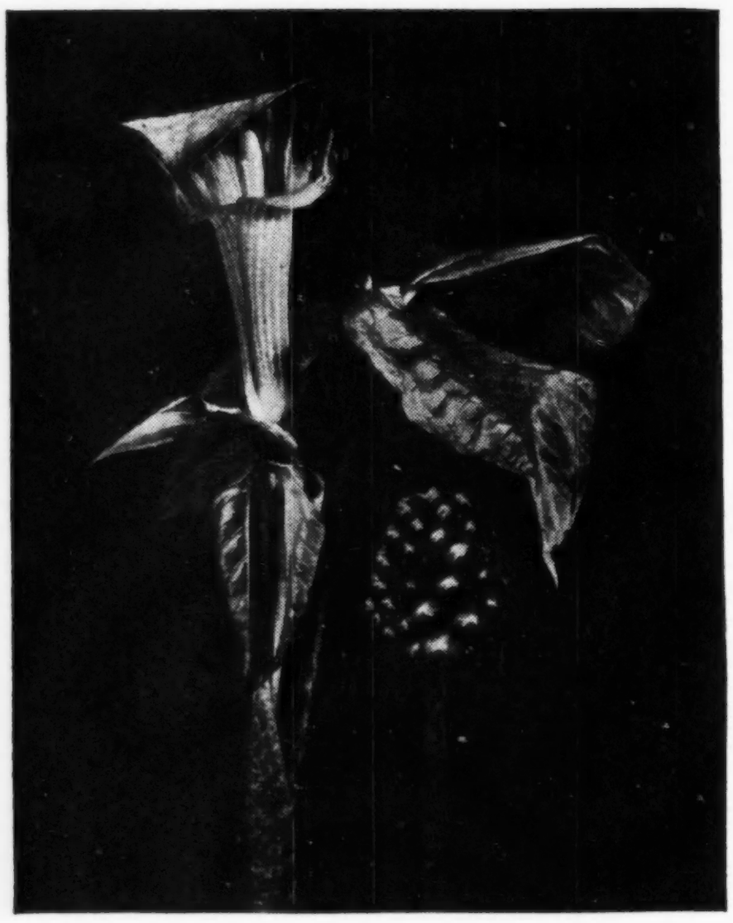
You and Sue and Bob and Jeff want to do something different today? Well, let me think. It is such a nice summer day, not too warm, let's take that nature walk we've talked about. We'll go through the woods and across the meadows till we come to the bank of the Passaic River. We'll keep our eyes open for some of the interesting plants that grow along the way.

Right here on the lower edge of the woods, in this moist, shady spot, we should find the fruits of Jack-in-the-pulpit. Yes, there they are. See that little club of greenish-red fruits? They are beginning to change color and soon will be a bright red. The club is "Jack". In May there were tiny brownish flowers on the little club, although you might not have taken them to be flowers. The club-shaped spike of flowers, or spadix, as botanists call it, was protected within a striped canopy. That is where the name Jack-in-the-pulpit came from. Mary, when she saw it, thought the canopy looked like a curled leaf, and so it does, but the proper term is spathe. Bob says that Jack-in-the-pulpit has six leaves. You're wrong, Bob. The plant has only two leaves; each leaf is divided into three parts.

Jack-in-the-pulpit is also called Indian turnip, for long ago Indians cooked the roots over their camp fires and ate them. We would not enjoy eating the roots, for they have a strong, bitter taste.

Do you know that Jack-in-the-pulpit is a relative of the skunk cabbage? Those thick clumps of big green leaves in the damp woods next to our home, Mary, are called skunk cabbages, because the plant has a very unpleasant odor. The flowers are among the earliest to appear in spring; they break through the ground even before the leaves unfold. You would no more recognize them as flowers than you would the flowers of Jack-in-the-pulpit. They are also produced on a club, or spadix, within a brownish colored hood, or spathe. Will you remember these two new words — spadix and spathe?

Bob is trying to attract our attention. What did he discover? In brushing aside the leaves under the oaks



The flower of Jack-in-the-pulpit is concealed within the spathe; the fruits are seen at the right.

on that slope, he found the partridge berry. This little plant practically hugs the ground. Its roundish, shining leaves are evergreen; that is, they remain green on the plant the year round. It has tiny, pinkish-white flowers in May which are borne in pairs, like twins. By the end of this month or in early September, there will be many red berries, which will hang on all winter, if the birds don't find them. The partridge or ruffled grouse is very partial to them — this is probably the reason why its common name is partridge berry. I think you might learn its botanical name, too: *Mitchella repens.*

You young folks are more familiar with this creeping groundcover than you realize. Sue, do you remember the round glass bowl your mother bought at the florist's shop last Christmas? There were little green leaves and bright red berries in it— they were the leaves and berries of the partridge berry. And the terrarium in your classroom, Jeff, also contained the the partridge berry. Don't you remember that your teacher told you she collected the little plant in the woods by the school? You are allowed to dig up some kinds of native plants and to pick some of the wild flowers, but you must never take more than you need and you must always be careful not to destroy neighboring plants. If you are thoughtful and careful, there will be plants for others to enjoy on their nature walks.

Where is Bob? He has left the woods and gone ahead to the meadow. Come along, we must catch up with him. I think he is behind that thicket of bayberry bushes. They grow all over this meadow, for they like its poor sandy soil and enjoy the warm sunshine. The dark green leaves are attractive and, when crushed, they have quite an aroma. Winter is well under way before all the leaves fall off. The flowers are so small, they're hardly noticeable; but from early fall through the cold days of winter, the bushes will carry a good crop of waxy, grey berries. Bayberries were used in colonial days to make fragrant candles — and these candles are still made in New England today. Birds like the berries and live on them all winter long. Nearly one hundred different kinds of birds eat these berries — the chickadee, downy woodpecker, catbird, bluebird, and flicker are a few. When you break branches from a bayberry bush to use in your homes, be careful of the number of branches you take. The more you remove from the bush, the less food our friends, the birds, will have.

Mary wants us to look at the butterfly weed and the milkweed. Actually, they are both milkweeds and belong to the same plant family, the milkweed family. Their botanical name is *Asclepias;* it is a Greek name and is pronounced As-klee-pi-as. These plants have been given the name of milkweeds because their leaves and stems

The seed pods of the milkweed have burst open, releasing the seeds that are carried aloft by the light, silky hairs.

contain a milky juice, or sap. The flowers of the butterfly weed are much more colorful than the dull brownish-purple flowers of the milkweed. They are a very bright orange and attract butterflies, so you can guess how the plant got its name. Some people prefer to call it the orange milkweed, instead of butterfly weed. It is also known as pleurisy root, for the early settlers used it as a cure for pleurisy.

The seed pods of the butterfly weed and milkweed are shaped like little boats. When the seeds are ripe, the pods burst open and the seeds float through the air, borne by the light silky hairs. During the last war, boys and girls through their schools and through Boy Scout and Girl Scout troops gathered milkweed seed pods, for the floss was used in making life preservers. It is very buoyant.

In the lower part of this meadow, where the soil is moist, Joe Pye weed is growing. It is one of the tallest of all wild flowers. I measured one last summer — it was over eight feet tall! Butterflies are attracted by the pinkish-purple, dome-like cluster of flowers. Do you know that the flower was named after an Indian to whom white settlers had given the name, Joe Pye? Joe Pye weed was used as a medicine in those early days.

Sue and Jeff have found a large patch of black-eyed Susans, which are so gay and bloom all summer from June through September. Yes, you may pick a bunch to take home to your mother, for they last long in water. You will not hurt the plants if you cut the flowers carefully — Bob has a Boy Scout knife in his pocket.

Black-eyed Susans belong to the same plant family as the daisies which star the meadows in June. It was a daisy, by the way, that was responsible for the first botanic garden in America.

John Bartram was a Pennsylvania farmer, back in the early seventeen hundreds. One day he picked a daisy in the field he was plowing, and while he was resting under a tree, he pulled off the petals one by one. Being curious about the different parts of the flower, he gathered a handful of daisies and took them into the farmhouse to look at them more closely. From that very day he began to study plants seriously and left the details of running his farm near Philadelphia to his hired helpers. John Bartram became one of the first outstanding botanists of our country and the garden, which he started in 1731, two hundred and twenty years ago, was the first botanic garden in America.

No, Jeff, you can't compare that botanic garden with The New York Botanical Garden which you visited during your Easter vacation. That early botanic garden was a garden on a farm, a garden where John Bartram planted and grew the many native trees and shrubs and flowers he collected on his trips into the woods and meadows. He shipped many of these plants to England and that is how English botanists and gardeners became acquainted with the plants that grow wild in our country.

The story of John Bartram shows, doesn't it, that you can never tell how a nature walk will end?

The Garden's Supporting Cast

(*Continued from page* 119)

ranged. Mr. Everett is usually in the greenhouse to offer suggestions or changes as the job progresses.

When she retires from the Garden, Emma Ahles plans to spend the rest of her life in the country. Her sons have begun to build a house for her at Hyde Park. The work progresses slowly because the boys can give their time to it only on week-ends and during vacations. By the time the house is completed, Mrs. Ahles will know where her rock garden should be placed, what plants will grow to best advantage near the small pond, and what landscaping is necessary. Meanwhile, she enjoys her work at The New York Botanical Garden. Pushing back an escaping lock of curly gray hair, she told me: "Every day I meet different people who have different reasons for being interested in plants. It is stimulating." Although Emma Ahles has made plans for her retirement in the future, it is obvious that she is not overly-anxious for the future to come.

God made the grain to drink the rain
and sun,
The tree to bear the fruit, the grass, the
seed;
He found the brooding darkness had
begun
To fold earth's offspring, rose and simple
weed
In a deep sleep the sunset hour of life.

God made the singing winds from His
own breath
And smiled upon the skies bejewelled
with light
He holds the moon and sun, both life and
death
In His eternal hands, He caused the night
To cover cherished dreams with a caress.

Hugh Findlay.

ADVANCES IN GENETICS. M. Demerec, Editor. 267 pages, indexed. Academic Press, New York. Volume III, 1950. $6.

The third volume in a series of collected reviews, edited by Dr. M. Demerec and an editorial board of twelve members, like the first two volumes, brings together in one convenient place a large amount of authoritative information covering the important, recent investigations in several widely different fields. While it is primarily a book for the specialist, it is also essential to anyone wishing to keep up with progress in genetics and cytology. The literature citations are extensive and for the most part adequate to acquaint the reader with the original sources of information.

Six quite unrelated fields of interest are treated, each by a specialist in the subject who has himself made important contributions and is competent to evaluate and interested in abstracting the reports of other investigations.

The first number deals with the cytology of bacteria by Berthe Delaporte. Much information has accumulated recently in this important field. While the treatment is brief, the reviewer brings together the essential facts covering some of the early history of investigations of the cytology of these organisms, methods of studying bacterial cytology, staining techniques and the essential features of bacterial cytology, including nuclear structures, with illustrations.

The second chapter is a review of biochemical genetics by N. H. Horowitz, one of the active workers in this field. Neurospora genetics has been extensively reviewed recently and fortunately so as information is accumulating rapidly. This review is well condensed and limited to the important recent findings.

One of the most difficult and detailed problems in genetics is the phenomenon of position effect very carefully reviewed by E. B. Lewis. The evidence, both new and old, is summarized in detail, making this one of the best places to obtain adequate information on this topic.

The theory of genetical recombination is again discussed mathematically by A. R. G. Owen, an authority in this field.

Somewhat out of place among the other reviews of theoretical genetics is the survey of recent developments in genetics applied to corn breeding by F. D. Richey. This is an excellent summary of important work with many useful references.

The last part is a review of parthenogenesis in animals by Esko Suomalainen. This difficult and confusing subject is treated carefully by one who is well able to deal with it. Naturally there are differences of opinion as to definitions and classifications of the various types of phenomena but, on the whole, the reviewer has reconciled diverse opinions skillfully.

Few books contain more useful and important information in such a small volume. No genetic libraries are too crowded to find room for this series of *Advances in Genetics.*

Donald F. Jones
Conn. Agricultural Experiment Station

THE SMUT FUNGI. George William Fischer. 387 pages, bibliography, index. Ronald Press, New York. 1951. $6.

As indicated by the subtitle, "A guide to the literature, with bibliography." Under each species of the smuts are given synonymy and nomenclatorial citations, followed (under as many as eleven headings) by references to publications on biology and control. There is a bibliography, arranged by authors' names, of 3,353 titles, and an index to names of smuts.

THE LILY YEARBOOK OF THE NORTH AMERICAN LILY SOCIETY. George L. Slate, Editor. 155 pages, illustrated. Published by the Society at Geneva, N. Y. Number three 1950. $2.50 to members, $3 to nonmembers.

The third annual yearbook, published by the North American Lily Society, contains over fifty articles on lilies in various phases. One of the most interesting contributions to its pages is by S. L. Emsweller, U.S. Dept. of Agriculture, on "Exploring for Pacific Coast Lilies of The United States."

THE SHELL COLLECTOR'S HANDBOOK. A. Hyatt Verrill. 228 pages, illustrated, indexed. G. P. Putnam's Sons, New York. 1950. $4.

Amateur shell hobbyists and others who are interested in shell collecting but do not know exactly how to proceed, will find this a good guide. Its pages reveal how, when and where to collect shells, how to clean and care for them, how to identify and classify them, and also describe many of the most interesting shells of the world and their unusual characteristics.

OLD HERBACEOUS. Reginald Arkell. 160 pages, Harcourt, Brace & Co., New York. 1951. $2.

Readers who love the England of *Goodbye Mr. Chips*, will love the England portrayed by Mr. Arkell, as they follow Bert Pinnegar, "Old Herbaceous", through his busy days as head gardener at the Manor. It is a charming story of a gardener from his early days when he won his first prize at the village show, to his late years when he could sit back and criticize the gardening accomplishments of the younger generation.

FOREST PRODUCTS. Nelson C. Brown. 399 pages, illustrated, indexed. John Wiley & Sons, New York. 1950. $5.

The great advances which have been made in the field of wood utiliization during and following World War II have inspired the publication of this book. It is essentially a revision of Professor Brown's *Timber Products and Industries*, published in 1935, which in turn followed *Forest Products, Their Manufacture and Use* by the same author published in 1919. Most of the chapters have not been materially revised from the previous edition, except to bring certain statistical information up to date. Four new chapters have been added. Two of the new chapters, entitled "Decreasing Use of Special Products" and "Increasing Use of Important Products", have replaced a former chapter on "Trends and Developments in Minor Forest Products Industries". Two additional chapters, which are completely new, cover wood densification and the new developments in pre-logging, integrated logging and re-logging.

Because of the broad scope of the subject of the book, its coverage of individual products and processes is necessarily brief. The author's efforts to reduce a very broad subject to a relatively few words have resulted, in several instances, in generalizations which leave the reader with mistaken impressions. An example of this is a comparison between the yield from logs converted into veneer by the rotary method and those cut into lumber by sawing. The reader is permitted to conclude that the absence of losses in saw kerf, slabs and edgings necessarily results in a substantially higher yield from rotary cutting veneer than from sawed lumber. This ignores veneer losses due to round up, clipping for defects, sizing in later processing operations and inability in many veneer operations to ultilize economically narrow widths. Further, it is not clear from the text that the veneer industry generally demands higher grades of logs than does the lumber industry and that higher yields in both operations are likely to be associated with higher log grades. Many rotary veneer operations actually produce lower yields than do saw mills using comparable raw material.

The space devoted to the various products discussed frequently does not reflect the relative commercial importance of the products. The outstanding example is the absence of a chapter or section on wood furniture. The gum naval stores industry, which has been receding in importance as a wood industry for many years, is given rather extensive coverage. The chapter on "Boxes and Crating Materials" does not reflect the major advances in wood packing of recent years.

(*Continued on page* 126)

News, Notes and Comments

Unveiling of Plaque in The Library. On the afternoon of May 10, a bronze plaque was unveiled by Miss Elizabeth C. Hall, Librarian, the engraving on which reads: "This library dedicated to the cause of horticulture and botanical science has been expanded and improved by public spirited citizens in honor of Mrs. Hugh D. Auchincloss, Mrs. Robert Bacon, Mrs. Jonathan Bulkley, Mrs. Carl A. De Gersdorff, Mrs. Walter Douglas, Mrs. Robert H. Fife, Mrs. Edward S. Harkness, Mrs. Elon Huntington Hooker, Mrs. Walter Jennings, Mrs. Gilbert H. Montague, Mrs. George W. Perkins, Mrs. Frederick B. Pratt, Mrs. Harold Irving Pratt, Mrs. Robert D. Pruyn, Mrs. Oakleigh Thorne. May 1951."

Dr. Robbins, in introducing Miss Hall to the gathering of distinguished guests, including members of the Board of Managers and Advisory Council, said that the library with its 56,000 volumes and the herbarium with its more than 2,500,000 specimens are the heart of The New York Botanical Garden, and the librarian is the heart of the heart. Miss Hall said: Today we serve a modern world, a streamlined world with imminent deadlines which have to be met. For many years, there has been a great need for modern equipment in our library to serve this demanding public. Through the generosity of a group of benefactors, there has recently been installed considerable new equipment. As spokesman for the staff, Miss Hall expressed appreciation of the gifts which made the acquisition of this new equipment possible. With it, she continued, the library will be better able to serve science and a modern world so dependent on science.

Annual Meeting. The annual meeting of the Corporation and of the Board of Managers of The New York Botanical Garden was held on May 10. New members elected to the Corporation were: Mrs. Henry B. Guthrie, Mrs. Volney F. Righter, Mrs. Charles D. Webster, Mrs. S. Laurence Bodine, Mrs. Charles G. Profitt, Mrs. Harold E. Anthony, Dr. L. O. Kunkel, Rev. Fr. Laurence J. McGinley, S. J.; and to the Board of Managers: Rev. Fr. Laurence J. McGinley, S. J., and Mrs. Thomas D.Thacher. Officers of the Corporation were elected to succeed themselves. Columbia University appointed Dr. Charles Glen King to the Board of Managers.

Charles B. Harding, in his report as President of The New York Botanical Garden, took a quick look at the future: Our long hoped-for laboratory building is in sight. To the $200,000 we were given a few years ago, an anonymous donor has generously added $150,000. With aid from the city, our funds available for the laboratory will be $500,000. The Board of Managers has authorized the obtaining of an architect and we hope to start building in the next year. We hope, before construction starts, to raise up to $250,000 more to give more room than the minimum floor space and also for equipment.

With the continued splendid help from Robert Moses, Commissioner of Parks, the city will soon begin the new bridge to replace Boulder Bridge and will complete the circular interior roadway. Especially exciting is the possibility, through city aid, said Mr. Harding, of repairing and assembling our exhibition greenhouse so that we can expand our shows and handle better the great crowds.

Charles B. Harding, President of The New York Botanical Garden and Miss Elizabeth C. Hall, Librarian, stand beneath the plaque which Miss Hall unveiled in the library on May 10, 1951.

Dr. William J. Robbins, in his report as Director, covered the accomplishments of the past year in the library, herbarium, scientific laboratory, horticultural and educational departments, publications, etc. He said, in part:

In 1950, collections were made in an unexplored area of southern Venezuela by Dr. Bassett Maguire, Curator at The New York Botanical Garden, Richard Cowan and John Wurdack. Collections were made also by Otto Degener, Honorary Curator of Hawaiian Botany on the islands of Oahu, Kauai and Maui and on Canton Island. Dr. Harold N. Moldenke, Curator at The New York Botanical Garden, collected in Sweden and Lapland. The plants obtained on these expeditions will serve as the basis for studies carried on at The New York Botanical Garden.

Various members of this staff devoted particular attention to important families of plants. During 1950, Dr. Moldenke continued his studies of the *Verbenaceae, Avicenniaceae, Stilbaceae, Symphoremaceae* and *Eriocaulaceae;* Dr. Henry A. Gleason continued his work on that interesting group of tropical plants, the *Melastomaceae;* Mr. Alexander devoted his attention to the *Crassulaceae* and the *Cactaceae*, two families in which there is much popular interest; Dr. Maguire is monographing the *Rapateaceae.*

Mr. Monachino has progressed in his studies of the genus *Strophanthus*, which assumed prominence because some species contain material from which cortisone has been made. Mr. Monachino expects to monograph this genus.

Dr. Donald P. Rogers has done research on the lower Basidiomycetes and on the truffle fungi.

Dr. P. P. Pirone has investigated the diseases of the London plane. He has also devoted attention to the crown rot of Delphinium caused by *Sclerotium delphinii*, and has conducted investigations on feeding of plants with mineral nutrients through the foliage.

The scientific laboratory has conducted investigations concerned with nutrition, especially of microorganisms; plant tumors and other types of abnormal plant growth, because of the similarities which exist between the development of these plant growths and animal cancer; antibacterial and antifungal substances, with particular attention to substances which inhibit the causal organism of tuberculosis; and antiviral substances.

Mr. Harding then presented Distinguished Service Awards to Dr. B. O. Dodge, Mrs. Elon Huntington Hooker, Colonel Robert H. Montgomery, Mrs. Harold I. Pratt, and Mrs. Joseph R. Swan, whose interest in The New York Botanical Garden has aided the advance of horticulture and botanical science.

A Memento of Gratitude to Venezuela. On Friday afternoon, April 20, 1951, ceremonies were held at The New York Botanical Garden at which a certificate was presented to the government of Venezuela reading:

"To recall with grateful appreciation the friendly helpfulness of the government and people of Venezuela in enhancing the knowledge of mankind and in furthering the sciences designed for human welfare through their general assistance to The New York Botanical Garden in the conduct of its botanical explorations in Venezuela."

Dr. David D. Keck, Head Curator of The New York Botanical Garden, briefly told of the Garden's long-time interest in Venezuelan flora and its explorations in that country, then introduced Charles B. Harding, President of The New York Botanical Garden, who presented the certificate to the Honorable Antonio Davila-Delgado, Consul General.

Garden Club of America. Included on the program of the thirty-eighth annual meeting of the Garden Club of America, held in New York City May 15, 16 and 17, was a visit to The New York Botanical Garden on the second day. Representatives of member clubs from thirty-five states and Hawaii were conducted on a tour to view, in particular, the planting of English wallflowers, which are rarely grown in this country, in the courtyard of the conservatory; the azalea garden; and the Thompson Memorial Rock Garden. The hillside in the azalea garden was aglow with the lovely colors of *Rhododendron obtusum Kaempferi.* There are also extensive plantings of mollis, japonica and Ghent azaleas.

The visitors viewed with considerable interest the exhibits, "thumbnail sketches of some of the varied activities of The New York Botanical Garden", which were staged effectively in the rotunda of the Museum and Administration Building. On display were its publications; rare books from the library; scientific studies of algae and fungi, which included groups of reef-forming algae, fungi showing relations to plants, and lichens; materials used to control plant pests and diseases; demonstration of the way in which the taxonomist handles plant identification, and publications by staff taxonomists; baskets and other woven articles, orchids and aroids from Venezuela; and exhibits on the laboratory's investigations of abnormal growth or plant tumors, vitamin B-12 assay using *Euglena gracilis*, and inhibition of bacteria and viruses.

Dr. William J. Robbins, in addressing the assembly of guests, explained briefly the founding of The New York Botanical Garden, its purposes and objectives. He stated that The New York Botanical Garden is not a local institution — its interests are world-wide, its reputation world-wide. The members of the Garden Club of America on their morning tour had seen the gardens and grounds which have been developed and maintained for the pleasure and relaxation of the public. A less obvious but more fundamental purpose of a botanic garden is to preserve, increase and disseminate knowledge of plants, and these activities had been shown to them in the exhibits in the Museum Building. The Garden Club of America, Dr. Robbins continued, has taken keen interest and played an important part in several of the projects of The New York Botanical Garden; for instance, it supported in part the Garden's 1950 Venezuelan expedition.

Top row, left to right, Frank K. Bell, Senior Vice President, Alcoa Steamship Co.; Paul Knapp, Alcoa Steamship Co.; H. R. Kunhardt, Jr., Chairman of the Expedition Committee; William C. White, President, Alcoa Steamship Co.

Center row, left to right, Charles B. Hitchcock, Secretary of American Geographical Society; Dr. George H. H. Tate, Curator, American Museum of Natural History; Dr. Bassett Maguire; Dr. David D. Keck.

Bottom row, left to right, Victor F. Schroeter, Vice President and Secretary of The Bolivian Society of the United States and Mrs. Schroeter; Charles B. Harding, President of The New York Botanical Garden; Antonio Davila-Delgado, Consul-General of Venezuela, and Mrs. Delgado.

T. H. Everett, Horticulturist, enlightened the gathering on a situation existing in America and gradually worsening — the limitation of plant material commercially available. The fact that neighborhood nurseries confine themselves to a limited variety of plants is reflected in modern landscaping, a sameness in the plantings around new homes. Citing *Phellodendron*, the cork tree, as a tree especially suitable for the ranch type of house, Mr. Everett stated that one would have to search through many nursery lists to locate it. The same can be said of *Cladrastis lutea* and *Chionanthus retusa*, both very desirable flowering trees.

How is it that such excellent plants are not readily obtainable? Mr. Everett gave three reasons for this deplorable condition: (1) It is easier and more profitable for a nurseryman to grow, catalog and sell 1,000 plants of ten different kinds than 1,000 plants of 100 different kinds, (2) The plant patent laws on hybrid plants which control propagation and licensing thereof, (3) Insufficient demand, according to nurserymen, for uncommon plant material.

Mr. Everett declared that there is some truth to the nurserymen's contention that there is no extensive demand for less common plants, although such a condition does seem strange. While Americans go to some length to express individuality in furnishing and decorating the interior of their homes, they apparently are not concerned with an expression of individuality in their gardens through the use of a wide variety of interesting plants, for they are content to buy the same plants as their next-door neighbor.

Traditionally, botanic gardens are concerned with promoting interest in plant material. The New York Botanical Garden promotes such interest by exhibits and displays, educational courses and publications, notably "The Garden Journal". Mr. Everett said he would like to advance another idea — he would like to see instituted a "plant of the season club" of The New York Botanical Garden. He spoke of the possibility of members of such a club paying an annual fee and in return receiving each year four or more rare or unusual garden plants.

Miss Elizabeth C. Hall, Librarian, stated that catalogs are an important part of a botanical and horticultural library, for the debut of a new variety may be hidden away in some nurseryman's catalog. The valid, original description of *Childsia Wercklei* appeared in the catalog of John Lewis Childs, Floral Park, L. I., 1899. Even such an authoritative reference as "INDEX KEWENSIS" accepts the validity of this description and says "Childs, Cat. Rar. Fl. 1899, 1." Artemisia Silver King

is another example — the first description appearing in the catalog of the American Rose & Plant Company, 1928.

All catalogs are particularly valuable to authors of books. The late Col. J. E. Spingarn, when working on clematis, and Richardson Wright, when doing his research on the rose Harison's Yellow, made good use of the catalogs in The New York Botanical Garden. There are approximately 17,000 catalogs, representing about 3,000 firms in the library. Some of the really old catalogs are: Bernard McMahon, Philadelphia, 1807; William Prince, Flushing, L. I., 1820, 1822, and 1828; Grant Thorburn & Son, New York City, 1825, 1838, 1840; Thomas Hogg & Sons, New York City, 1834 and 1847.

Hobitzelle National Award. Dr. C. E. Marshall, chemist on the staff of the College of Agriculture, University of Missouri, is the first recipient of the Hoblitzelle National Award in Agricultural Sciences — a $5,000 stipend and a gold medal. The award was presented to Dr. Marshall for having measured the action of plant food chemicals as they enter the roots of growing plants. His research opens the door to more positive methods of manipulating and managing the fertility and thereby the productivity of the soil. Previously, scientists had been able to measure only the total amount of the chemical elements held on the surface of soils and "available" as food for plants.

Dr. Marshall was chosen from a list of seventy scientists from all parts of the United States, whose achievements were submitted by regional committees of the Awards Committee of the Texas Research Foundation at Renner, Texas. Nominated for the award by the New York Regional Committee, of which Dr. William J. Robbins, Director of The New York Botanical Garden is a member, were Dr. Donald Reddick, Professor of Plant Pathology at Cornell University, for his work which resulted in new information on the potato and has produced several late blight resistant varieties; and C. Earl Libby and Frederick W. O'Neil, of the New York State College of Forestry, for their development of "Chemigroundwood", a chemical paper pulp derived from hard wood.

Advisory Council Luncheon. The Advisory Council entertained at luncheon at The New York Botanical Garden, on May 23, representatives of various women's organizations — Bryn Mawr Club; Wellesley Club; Vassar Club; Smith College Club; Holland Dames, Barnard Club; Daughters of the Order of the Cincinnati; City Gardens Club; Cosmopolitan Club; Colonial Dames of America; Junior League; Garden Club of America; N. Y. State Federation of Garden Clubs; Horticultural Society of New York City. Mrs. Vincent R. Impellitteri was guest of honor; Mrs. Robert Moses, wife of Park Commissioner Moses, was also a guest.

Park Association of New York City, Inc. The Park Association of New York City, Inc., in cooperation with the Bronx Chamber of Commerce, made a tour of playgrounds and parks in the Bronx on May 23. They visited points of interest on the grounds of The New York Botanical Garden and were received by Mrs. Harold I. Pratt. Member of the Board of Managers, Mrs. Hermann G. Place, Chairman of the Advisory Council and Mrs. Vincent R. Impellitteri, wife of Mayor Impellitteri.

Thatched hut similar to one in which Dr. Bassett Maguire and his assistants, Richard Cowan and John Wurdack, lived while exploring Venezuela recently. Hammocks, carrying baskets, water gourds, machetes, spears, arrows and blowguns may be seen.

Research in Chemical Weed Control. Research in chemical weed control at the Agricultural Experiment Station, Rutgers, N. J., has been expanded to include a study of "surfactants", synthetic chemicals related to modern super-detergents and wetting agents. The research is made possible by a graduate fellowship, in the amount of $4,000 for two-year study, from the Antara Products Division of General Dyestuff Corporation.

Two years, including field tests, will be devoted to this study by Lee Bannerman, working under the direction of Dr. Gilbert H. Ahlgren and Dr. Richard Aldrich.

Tribute to Gunther K. Ackerman. On May 24, 1951, in the lecture hall of The New York Botanical Garden, a very special occasion took place. J. Mark Kerans, Administrator, stated that 156 of the 157 employees of The New York Botanical Garden were aware of a certain situation and the meeting had been called to let the remaining one employee know about it. Dr. William J. Robbins then said that the purpose of the meeting was to honor Gunther K. Ackerman who has performed his duties effectively, efficiently and faithfully for more than fifty years as an employee of The New York Botanical Garden. A. C. Pfander pointed out some of the physical changes at the Garden which Mr. Ackerman has witnessed in his long term of employment. E. Maguire presented Mr. Ackerman with a wallet from all the employees and then introduced Charles B. Harding, President of The New York Botanical Garden. Mr. Harding, on behalf of the Garden, presented a watch to Mr. Ackerman in recognition and sincere appreciation of his many years of loyal service.

Rose-Growers' Day. Rose-Growers' Day at The New York Botanical Garden attracted a large attendance of enthusiastic rose growers from nearby states and also from the states of North and South Carolina, Georgia and Florida. The auditorium in the Museum Building was well filled when Dr. William J. Robbins, Director of The New York Botanical Garden, extended words of welcome and introduced the guest speaker, Dr. John B. Carson, former director of the American Rose Society and President of the Pennsylvania Horticultural Society. Dr. Carson gave a talk on "Planting and Care of Roses", based on his own practical experience with roses as he grows them in his beautiful garden at Newtown Square, Pa. T. H. Everett, Horticulturist, conducted a lively question and answer session during which Mrs. Dorothea Bobbink White, Edwin C. Beckett, George H. Gillies, Everett A. Piester, Paul Frese and Dr. P. P. Pirone, Plant Pathologist, answered the many questions supplied by the visitors.

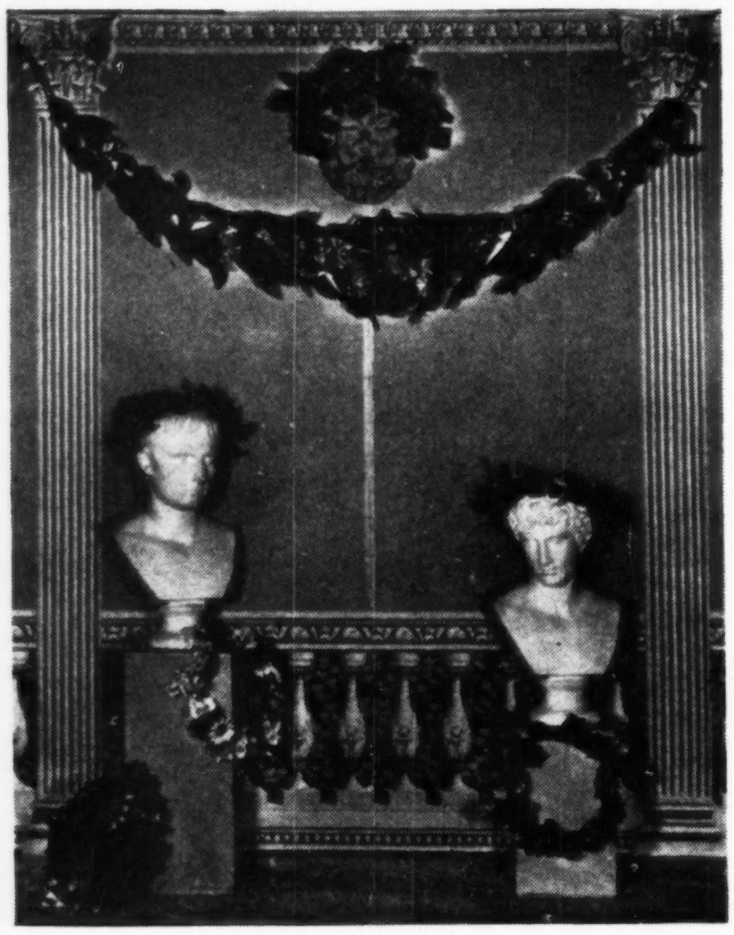
In the afternoon the shelter house in the rose garden, which was made possible through the generosity of Mrs. Elon Huntington Hooker, was dedicated by Dr. William J. Robbins, who said in part:

At a meeting of the Board of Managers of The New York Botanical Garden in April, 1915, the cooperation of the Horticultural Society of New York in establishing a rose garden at The New York Botanical Garden was accepted. Mrs. Beatrice Farrand, noted landscape architect, was invited to make detailed plans which were prepared with the advice of Frederick R. Newbold, representing the Horticultural Society of New York. During the autumn of 1915, 200 members and friends of The New York Botanical Garden and of the Horticultural Society of New York examined this site for its suitability as a location for the rose garden. The plan prepared by Mrs. Farrand was approved early in 1916 and the ground

Left: Wreaths and garlands of the Renaissance period; garland of fruit adapted from Andrea Mantegna's panel of St. George; wreath at the foot of the stool is a copy of the garland of Flora, by Botticelli; Della Robbia armorial plate (by courtesy of Metropolitan Museum of Art); tazza filled with grapes and wheat ears; goblet drawn from description of the wedding of Anne of Cleves to Henry the VIII.

Below: Wreaths and garlands of the Classic Period; the grape crown of Bacchus, the wheat and poppy crown sacred to Ceres, and a violet and ivy crown such as Alcibiades is said to have worn.

These illustrations show part of the exhibit of historic wreaths and garlands and May customs in the Museum of The New York Botanical Garden, which will continue through the summer.



for the rose garden was formally broken in May 1916, with Francis Lind Stetson driving the team and Mrs. George W. Perkins holding the plow. The planting of some 5,000 rose plants, contributed through the Horticultural Society of New York, was begun in April 1917; by 1918, some 359 kinds of roses were flowering in the new rose graden.

Since that time many friends of The New York Botanical Garden have cooperated in making this garden a distinguished one. The granite memorial stairway leading into the rose garden was a gift from Mrs. Robert E. Westcott in 1916. At the north end of the rose garden a plaque was dedicated in 1939 to honor the late Lambertus C. Bobbink, a great rosarian whose counsel and generosity through many years helped to make this garden possible. Through the firm of Bobbink & Atkins rose plants have been contributed year by year to keep up the quality of material. The sitting area at the north was donated by Mrs. Theodore Havemeyer; the sitting area on the east, by Henry F. du Pont; and for the general plan for the improvements made in this section of The New York Botanical Garden during the past year, we are indebted to Miss Marian Coffin, landscape architect.

Now this shelter house is given by Mrs. Elon Huntington Hooker, Member of the Advisory Council and its president for many years, and Member of the Board of Managers.

Charles B. Harding, President of The New York Botanical Garden, called attention to the many services which Mrs. Hooker had rendered to The New York Botanical Garden through the thirty-five years since she became one of its most interested members. Then he turned to Mrs. Hooker and presented her with a pair of shears with which she cut the ribbons and opened the shelter house to the public. Henry de la Montagne, Assistant Director, then unveiled the plaque which reads: "This shelter house was given by Mrs. Elon Huntington Hooker to afford a quiet place for contemplation of the rose garden. May 1951."

Graduation Exercises at The New York Botanical Garden. On June 21, George W. Partridge and Norman Vogel were presented with certificates on completion of the Two-Year Science Course in Gardening, and Evelyn Ager, F. David Lapham, Mrs. David M. Proudfoot, Joan Regina Suplicki, Mrs. William Tingue and Irving J. Wynne were presented with certificates on completion of the Practical Gardening Course. Dr. David D. Keck, Head Curator of The New York Botanical Garden, addressed the graduates and their friends on "Climatic Influence on Native Plants".

Advisory Council. At a meeting of the Executive Committee of the Board of Managers held on April 30, Mrs. Harold E. Anthony, Mrs. S. Laurence Bodine, and Mrs. Charles G. Proffitt were elected members of the Advisory Council of The New York Botanical Garden.

Book Reviews

(*Continued from page* 122)

The book is easy to read as are all of Professor Brown's books. It will be useful to persons interested primarily in a broad picture of the forest products industries and not concerned with the technical preciseness of details. The amount of new material in the book scarcely justifies its publication under a new title. In view of the many new developments in the field of forest products manufacture, it is unfortunate that a more thorough revision was not undertaken.

James S. Bethel
School of Forestry
University of North Carolina

EXPLORING OUR NATIONAL PARKS AND MONUMENTS. Devereux Butcher. 224 pages, illustrated with 227 photographs, 2 maps; indexed. Houghton Mifflin Co., Boston, Mass. Second edition 1949. $2, paper bound, $3.50 cloth.

Nature lovers, vacationists, and, in fact, all who enjoy the natural beauties of America, will appreciate this authoritative guide. The author, who is executive Secretary of the National Parks Association and Editor of National Parks magazine, is well qualified to bring together complete descriptions of the 26 national parks and 38 nature monuments from coast to coast, also useful information on accommodations and recreational facilities in these reservations.

TULIPOMANIA. Wilfrid Blunt. 32 pages plus sixteen plates from 17th century water colors by Alexander Marshall. A King Penguin Book. Allen Lane, Inc., Baltimore, Md. 1950. 75c.

During the great tulip era of the seventeenth century, when tulips were the chief object of financial speculations in Holland and fortunes were won and lost over them, elaborate varieties were bred which make the modern tulips appear insignificant. Wars retarded the acceptance of the tulip in France, but shortly after 1600 no woman of fashion would be seen in spring without a bunch of rare blooms tucked into her low-cut dress, and within a few years bulbs changed hands for fantastic sums. For one bulb, a miller agreed to part with his mill; a young Frenchman received with delight for his bride's dowry a single rare tulip bulb, while another exchanged a flourishing brewery valued at 30,000 francs for a bulb named "Tulipe Brassiere".

The tulip craze was at its height between the years 1634 and 1637 in Holland where everyone who had a few square yards of backyard was growing bulbs. Tulip growing and speculation were synonymous. All alike, from noblemen to laborers, took part in the gamble. In every town in Holland, taverns were chosen for tulip trading. In one deal a profit of ten million pounds was made while the mania lasted.

The Darwin tulip developed in the heart of Asia, first placed upon the market in 1889, has become a universal favorite. There are yet many problems connected with the tulip to be solved and a fuller explanation may some day be made of the virus which causes them to "break".

The sixteen water-colors in *Tulipomania* are reproduced by gracious permission of His Majesty, the King, from one of a pair of volumes of flower paintings by Alexander Marshall preserved in the Royal Library at Windsor. These rare folios were purchased in a Brussels sales room in 1818, and later passed into the Royal Collection.

Felix R.Tyroler, Exec. Sec.
National Tulip Society.

HOME ORCHID GROWING. Rebecca Tyson Northen. 286 pages, illustrated, indexed. D. Van Nostrand Co., New York. 1950. $6.

Rebecca T. Northen begins by telling

(*Continued on page* 128)

Wayside Gardens

Enchantment

Outstanding New GARDEN SUBJECTS

Year after year, we here at Wayside carefully select only superior quality stock to grow and develop into the high-grade quality merchandise semi-annually offered in the world's finest horticultural catalogs.

This Fall, make the quality test—plant Wayside Gardens' hardy "pedigreed" plants. See the difference this superior quality makes in greater garden beauty—a difference that will be apparent for years to come.

William Tell

New giant *Ideal Darwin* tulip—26" tall. Pure raspberry-rose outside, rich rose-pink inside with shining white center and black anthers.

VIBRANTLY GLOWING NEW LILIES

Mid-Century hybrids are the foolproof lilies everyone has been waiting for. They will grow, multiply and flourish in any garden. Exquisite blooms have a glowing and luminous sheen rarely seen in flowers. Of the 12 superb, distinct, easily grown varieties, *Enchantment* and *Valencia* are top favorites.

The new lily **ENCHANTMENT.** You can't fail with this sensational new variety. It is the most vigorous lily in cultivation. Huge nasturtium-red flowers with a glowing, luminous sheen bloom week after week on giant, upright stalks. . . . Dozen $9.00

TULIPS OF THE FUTURE

It may sound boastful, still the fact remains, Wayside Gardens is undisputedly America's largest introducer of new, rare and unusual tulips—years ahead of everyone else in the number of outstanding new varieties presented. Nowhere else in this country can you find the large and varied selection of choice, top-quality, imported tulips offered in Wayside's Fall Catalog. It is filled with all the newest, improved sorts, many of which are procurable only at Wayside. For big, brilliant "Talk of the Town" blooms, be sure to plant Wayside Gardens' topnotch, superior bulbs—they are the best your money can buy.

1952 ALL-AMERICA ROSE SELECTIONS

FRED HOWARD. Finest yellow hybrid tea of modern times. Strong, hardy plants produce glorious flowers from spring until late fall. Long, rich, yellow buds tipped with soft pink bloom on sturdy stems. Charming contrast to reds and pinks. . . Each $2.75

VOGUE. Enchanting new floribunda of bright, glowing rose flushed with salmon. Superb 3½" roses have subtle, spice-like scent that is delightful in garden and indoors. Stunning color accent in front of shrubs and fences. . . Each $2.25; Doz. $24.00

NEW DAFFODILS

DUKE OF WINDSOR and **GREEN EMERALD,** the new weatherproof daffodils are the finest ever introduced. Enormous flowers of breathtaking beauty grow, multiply and bloom gaily year after year, unafraid of sun, wind or rain.

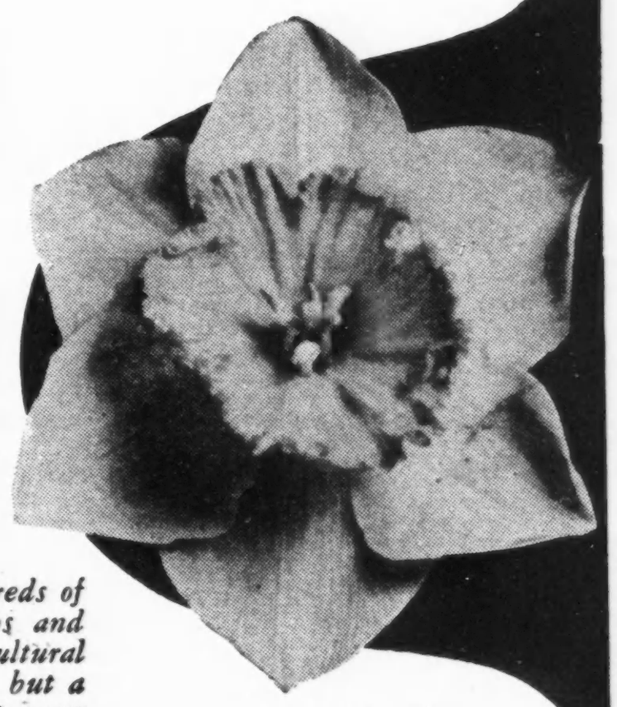
PINK DAFFODILS. Delightful pink and apricot flowers that rival orchids in their jewel-like perfection. 13 fascinating varieties with *Siam* a leader. See Catalog pgs. 44 to 55 for many other exciting new daffodils.

Helen Traubel

HELEN TRAUBEL. Rare new star in the rose kingdom. Color of this sparkling new hybrid tea varies from lovely pink to luminous apricot, blending into rich orange. Sturdy plants bear a profusion of perfect flowers that are not affected by extremes in weather. . . . . Each $2.75

SEND FOR THE WORLD'S FINEST HORTICULTURAL BOOK-CATALOG

Wayside's new catalog for autumn planting is "better than ever". 128 pages of wondrous beauty and glorious color for your garden. Hundreds of the world's newest and best flowers, shrubs and plants illustrated in true color with complete cultural directions for each item. Not just a catalog, but a valuable reference book. ***To be sure you get your copy, it is necessary that you enclose with your request 50¢, coin or stamps, to cover postage and handling costs.***



Duke of Windsor

51 MENTOR AVE. MENTOR, OHIO

Wayside Gardens

FROM THE HERB SHELF

LEMONADE FOR HELEN M. FOX

When the noted herb authority, Helen M. Fox, visited our garden last summer, the sun was so hot that not even the exhilarating aromas of the herbs kept us from wilting after a quick tour of the paths. After retiring to the shade of the house, I wanted to serve a refreshing beverage that could be prepared quickly. The first thing that offered itself was a can of frozen lemonade. When this was mixed and tasted for sweetness, it did not seem interesting enough to offer to such a special guest, so I added one half cup of angelica syrup. This gave a pale green color to the well-iced drink and increased its piquancy delightfully. When decorated with golden-green leaves of fresh angelica, it looked as good as it tasted.

The angelica syrup, made when candying the stems of the herb for decorating cakes, is always at hand to serve as a sauce for ice cream or to take the place of grenadine in mixed drinks.

CANDIED ANGELICA

Cut young stalks of angelica in short lengths. Soak over-night in cold water to which a tablespoon of salt has been added. Parboil until the stems become quite green. Drain, while bringing a thick sugar syrup (half as much water as sugar) to a boil. The angelica may be cooked in this syrup until it is clear or 230° F. Another method is to pour the boiling sugar over the stems and let stand over-night. In the morning the syrup is poured off, boiled again with a little more sugar and again poured over the angelica. This is repeated for three days until the stalks are clear and tender. A few angelica stalks cooked with rhubarb or rhubarb jam adds a piquant tang.

Gertrude B. Foster.

The name angelica was bestowed on this herb because of the belief of people years ago in its "angelic" healing properties. Its present connection with medicine is chiefly confined to use as an aromatic bitter. Oil from its roots and seeds is utilized in the manufacture of liqueurs and perfumes. *Angelica Archangelica*, which bears greenish-white flowers, reaches a height of five feet. It prefers a moist soil and partial shade, but will do well in most soils.

Book Reviews

(*Continued from page* 126)

you that orchids are just plain plants. In a most informal and provocative style, she leads you from there through their glamorous background down to their present day position as plants for everyone to grow. She writes of hybridization so as to make it not only clearly understandable, but infinitely inviting — an occupation fraught with drama, and one you cannot wait to begin. She deals with all phases of orchid growing from seed to market, including the making of corsages. Not only does Mrs. Northen describe in detail thousands of orchid varieties, and solve the problems of their care and culture, but at the same time she fills you with inspiration, till you can't wait to get started.

What I especially appreciate about *Home Orchid Growing* is that in it you learn *what* to do, *when* and *how* in simple language with plenty of pictures, *and*. also, *why*. The author goes deeply not only into cattleyas but most of the botanical species as well, those less known, less grown, but equally appealing. I'm delighted to see emphasis on *Odontoglossum*, *Epidendrum*, *Oncidium*, and the lovely *Miltonia*. The book is profusely illustrated with color and black-and-white photographs, and also drawings.

Those of us who already grow orchids will follow Mrs. Northen's lead into new adventures with them, while others who haven't yet been caught by their magic will want to buy Mrs. Northen's book and their first orchid simultaneously.

Jean Hersey.

THE EYES OF DISCOVERY. John Bakeless. 439 pages, illustrated, indexed. J. B. Lippincott Co., Philadelphia, Pa. 1950. $5.

In *The Eyes of Discovery* Mr. Bakeless has given us a very useful and interesting book, and even to the layman, it sounds authentic when he tells us what this continent was like before there were any signs of man here. How it appeared to the first red man who crossed Bering Straits and subsequently to the first white men, Columbus and his followers; what the rivers and mountains and plains looked like, with what vegetation they were covered and what animals roamed over them. He tells us all this in straightforward prose. Mr. Bakeless divides the country into geographical regions and carefully follows the trails of the different European explorers since Columbus; Spanish, French, English, Dutch and finally American, the Lewis and Clark expedition 1804-05. Each comes in for his turn.

This book is well organized and full of valuable information. It is the story of a continent packed into 400 pages.

Amy Spingarn.

Bobbink & Atkins

"GARDEN GEMS"

for your Garden Library

Build your garden with the help of this outstanding catalog. In it are described and illustrated in color the best of the *New* and *Old-fashioned Roses; Unusual Evergreen Shrubs* and *Vines; Azaleas* and *Rhododendrons; Magnolias; Lilacs* and many other *Flowering Shrubs;* all the novelty and old favorite *Perennial Flowers* and *Ground Covers*, and a host of other rare and unusual *"Garden Gems;* designed to help you plan and plant your garden.

Free east of the Mississippi; 35 *cents elsewhere. Customers of record receive their copies automatically.*

Visitors are always welcome at our nurseries located about nine miles from the New Jersey side of the Lincoln and Holland Tunnels and George Washington Bridge. Less than thirty minutes from central New York.

Bobbink & Atkins

Rose Growers and Nurserymen

401 Paterson Ave., East Rutherford, N. J.

"Yankee Lawn"

(*Continued from page* 102)

use limestone on lawns because of the possibility of getting the soil too sweet for gardenias, camellias, and azaleas; but since we have demonstrated here at the experimental station that these plants grow better with limestone, even on very sweet soils, there is hope that we can enjoy excellent permanent lawns just as you do in the northern states.

Plot No.	Variety	Condition of lawn after two winters
1	Zoysia. Stolons (*Osterdamia japonica*)	Turf spotty. Dormant in winter. Weedy.
2	Charleston grass. Stolons (Don't know the genus)	Very poor turf. Weedy.
3	Bermuda Seed (*Capr ola dactylon*)	No turf. Weedy. Dormant in winter.
4	Creeping bent. Seed (*Agrostis stolonifera*)	Good turf with a few weedy spots.
5	Carpet grass. Seed (*Axonopus compressus*)	Fair turf. Weeds coming in badly.
6	Seaside bent. Seed (*Agrostis canina* or *maritima*)	Excellent turf winter and summer.
7	Kentucky bluegrass. Seed (*Poa pratensis*)	Excellent turn in winter, slight dormancy in hot weather if dry.
8	Red top (*Agrostis palustris*)	Good turf. Not as good, however, second year as first year.

PUBLICATIONS OF THE NEW YORK BOTANICAL GARDEN

Books, Booklets, and Special Numbers of the Journal

An Illustrated Flora of the Northern United States and Canada. by Nathaniel Lord Britton and Addison Brown. Three volumes, giving descriptions and illustrations of 4,666 species. Second edition, reprinted. $15.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. 1932. $6.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages, illustrated. A handbook especially compiled for the beginner. 1935. Second edition 1947. $2.

The Bahama Flora. by Nathaniel Lord Britton and Charles Frederick Millspaugh. 695 pages. Descriptions of the spermatophytes, pteridophytes, bryophytes, and thallophytes of the Bahamas, with keys, notes on explorations and collections, bibliography, and index. 1920. $6.25.

North American Cariceae, by Kenneth K. Mackenzie, containing 539 plates of *Carex* and related plants by Harry C. Creutzburg, with a description of each species. Indexed. 1940. Two volumes, 10¾ x 13½ inches; bound $17.50. Foreign postage extra.

Keys to the North American Species of Carex, by K. K. Mackenzie. From Vol. 19, Part 1, of *North American Flora.* $1.25.

Plants of the Holy Scriptures, by Eleanor King, with a check-list of plants that are mentioned in the Bible, each one accompanied by a quotation. Revised from the Journal of March 1941. 23 pages, illustrated. 1948. 25 cents.

Food and Drug Plants of the North American Indian. Two illustrated articles by Marion A. & G. L. Wittrock in the Journal for March 1942. 15 cents.

Vegetables and Fruits for the Home Garden. Four authoritative articles reprinted from the Journal, 21 pages, illustrated, Edited by Carol H. Woodward. 1941. 15 cents.

The Flora of the Unicorn Tapestries, by E. J. Alexander and Carol H. Woodward. 28 pages, illustrated with photographs and drawings; bound with paper. 1941. Second Edition 1947. Third Edition 1950. 25 cents.

Catalog of Hardy Trees and Shrubs. A list of the woody plants being grown outdoors at the New York Botanical Garden in 1942, in 127 pages with notes, a map, and 20 illustrations. 75 cents.

Succulent Plants of New and Old World Deserts, by E. J. Alexander. 64 pages, indexed. 350 species treated, 100 illustrated. Bound in paper. 1942. Second edition 1944. Third edition 1950. 50 cents.

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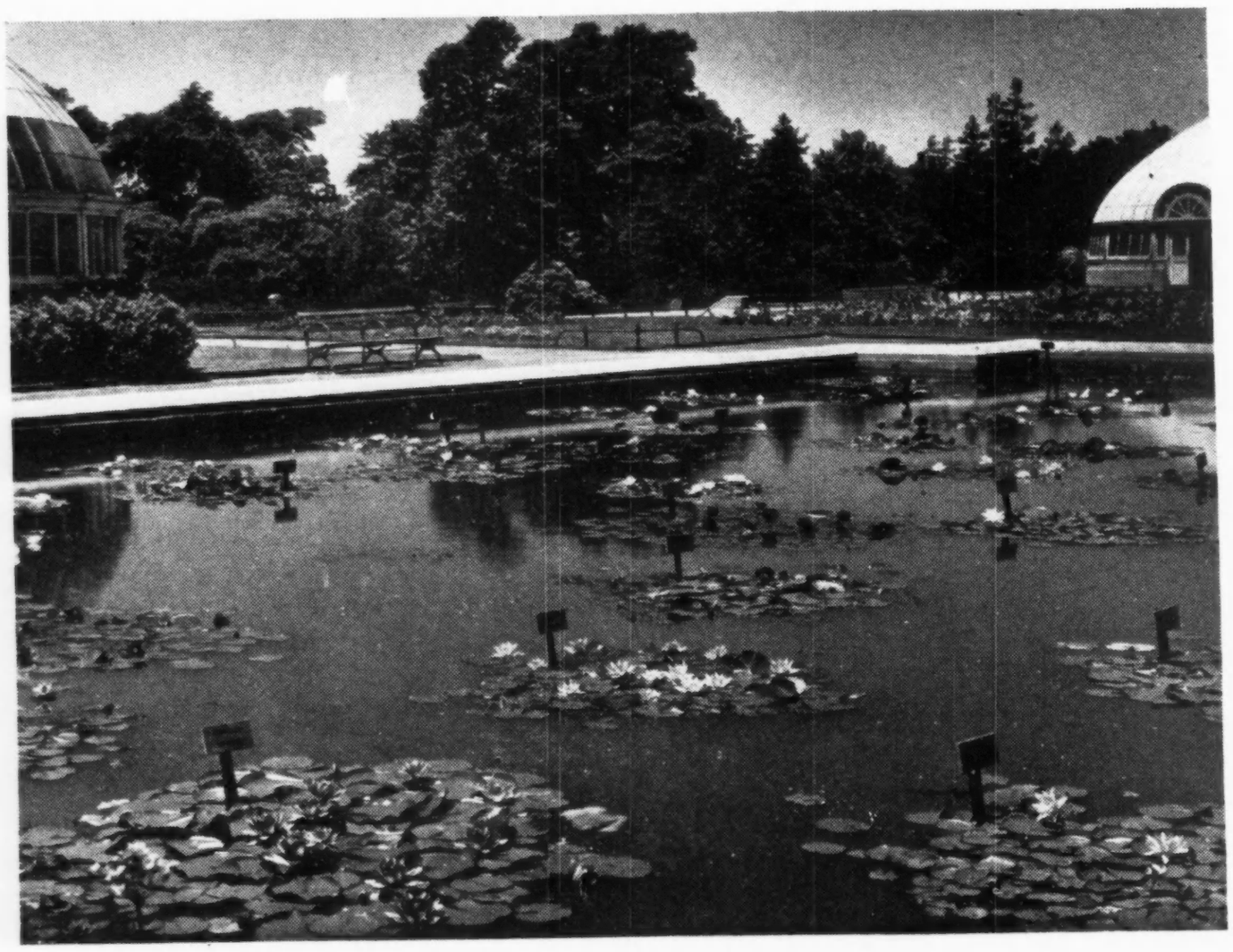
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